

The AUTOMOBILE

NEW YORK SHOW ISSUE

1915—A 7-League Stride

Eight-Cylinder Motors—Sixes for Less Than \$800—Vacuum Feed—Spiral Bevel Gears—Better Equipment—The Year's Milestones

SIXES for less than \$800; eight-cylinder motors; block-cast, unit power plants; high stroke-bore ratios; spiral-bevel drive; vacuum-feed; cantilever springs; lower weights; smaller tire and maintenance expense are the giant strides in the automobile industry during 1914.

Cars are lower priced. A year ago the cheapest six was \$1,500, now it is \$750—a 50 per cent. reduction.

With the reduction in weight have come longer, lower lines. Cleanness of design has been typified in the rush to the standards of block design. Although S. A. E. horsepowers on the average are reduced, the growth of the high-speed, high-efficiency design has put our motors on a higher plane than ever before.

Better equipment is offered at the lower price. The average car of today sells for \$2,005; lower than at any time in the history of the industry. Yet the car of today is more comfortable, easier riding and has far more to offer in the way of comforts for its passengers than ever before. The one-person top, cord tires, fine dash equipment, better control features, motor-driven tire pumps, and luxurious upholstery even on cars selling for below \$1,000 are noteworthy features in development.

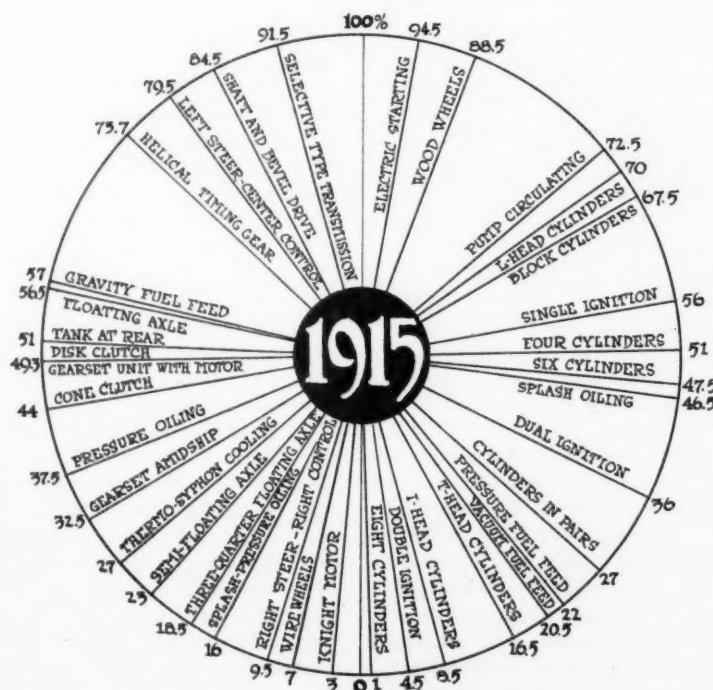
Bodies are handsomer.

The clean moulded lines have developed during the year. Side lamps have been eliminated; battery boxes taken from the running boards. The introduction of vacuum feed and the removal of the tank from below the front seat has permitted lower lines. Prominent makers have increased the drop in the frames, heightening this effect. Electric starting and lighting is used on cars costing as low as \$600.

In numbers our automobile manufacturers are fewer than they were a year ago, and in fact the numbers have been annually growing fewer ever since 1911. We have now listed 119 manufacturers as against 133 in January 1914, 156 in 1913, 193 in 1912, 270 in 1911, and 239 in 1910. The year of 1911 was the zenith in the number of manufacturers.

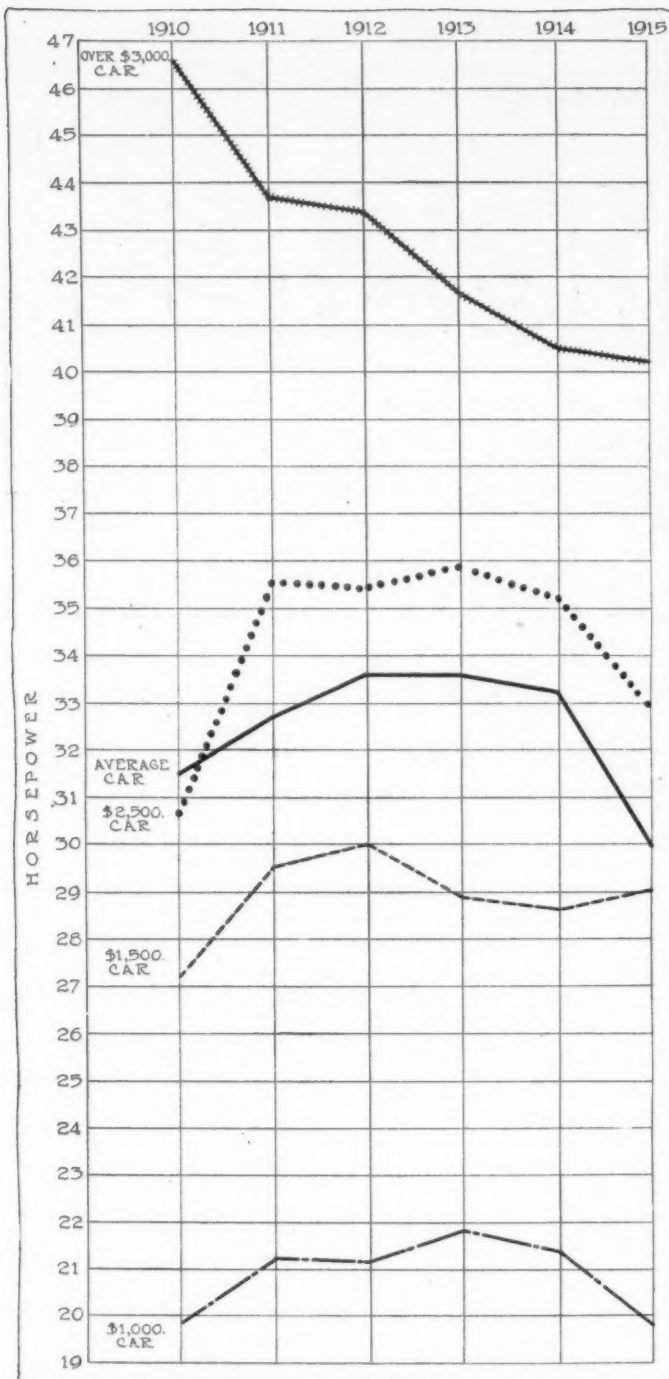
Fewer Chassis Models

The number of chassis models has had its rise and fall in the same proportion. In 1910 there were 364 chassis, in 1911, 393; in 1912, 381 and in the remaining 3 years to January, 1915, 339, 236, 200. Although there are but 200 chassis offered by the manufacturers, there are 535 cars, an average of more than 2.5 car models to the chassis. The number of cars offered a year ago was 607. These cover all types of body and offer a broad choice



THE 1915 CYCLE OF PROGRESS IN DESIGN

Nearly half our cars are sixes; 70 per cent. have L-head cylinders; 67.5 per cent. have the cylinders cast in block; vacuum fuel feed, unused a year ago, is now fitted on 20.5 per cent. of the cars; left steer and center control is used on 79.5 per cent., and helical timing gears on 73.7 per cent.



HORSEPOWER TRENDS FOR 5 YEARS

The average horsepower is lower now than a year ago. In the car at over \$3,000 it has descended steadily. In the \$2,500 car it has zigzagged for 5 years and similarly in the other price classes. It is now lower in every class except that of the \$1,500 car

to the purchaser in size, price and important specifications.

Fifty-eight of our makers are listing but one chassis. In these, twenty-seven are selling cars below \$1,250, twelve are selling cars between \$1,250 and \$1,999, eleven from \$2,000 to \$2,999 and eight at more than \$3,000. These four price classifications cover the range of cars and, since the selling price must govern the allowable cost of manufacture, and hence, the whole groundwork of engineering design, it is purposed to study the trends in each of these classes independently. For convenience, we will call them the \$1,000, \$1,500, \$2,500 and \$4,000 cars.

Two reasons may be given for the increase in wheelbase length during the past year. The principal one is the increase in sixes. These, which have grown remarkable in

numbers in the \$1,500 class are universally longer than the fours which they have replaced. In other instances a longer wheelbase has been taken up in the body. The biggest increase was made by Hupmobile which is now 13 inches longer; the greater length being required by the larger motor and roomier body. Several other makers have increased the wheelbases 1 to 2 inches, the added space going into the body.

Wheelbase Has Increased

We have wavered between 121 and 122 inches alternately since 1912. In 1911 the average wheelbase was 114 inches and in 1910, 112 inches. The years of the biggest change in wheelbase were between 1910 and 1912 as in these 2 years it increased 9 inches, whereas, since that time it has only varied within the limits of 1 inch. The general average of all chassis is 122.2 inches, in 1914 it was 121 inches, for 1913 it was 122, the same as for 1915, and in 1912 it was the same as for the 1914 season.

The \$1,000 car is only .37-inch longer than it was in 1914, but between 1913 and 1914 there was a gain of 4 inches; between 1912 and 1913 there was a loss of 1 inch. Thus in the low-priced cars also we find the years of doubt in length to be from 1912 to 1915, when the wavering of figures was between 103 and 107. As in the general average, the upward trend in wheelbase was in 1910 to 1912, when it rose from 96 to 104 inches.

The wheelbase of the \$1,500 car has increased steadily during the last five years, reaching its highest point in 1915, 121.6 inches or a gain of 3 inches over 1914. From 1910 the growth of wheelbase was steady until last year when it was .5 inch less than in 1913. The figures are: 1910, 109 inches; 1911, 114 inches; 1912, 116 inches; 1913, 119 inches; and 1914, 118.5 inches.

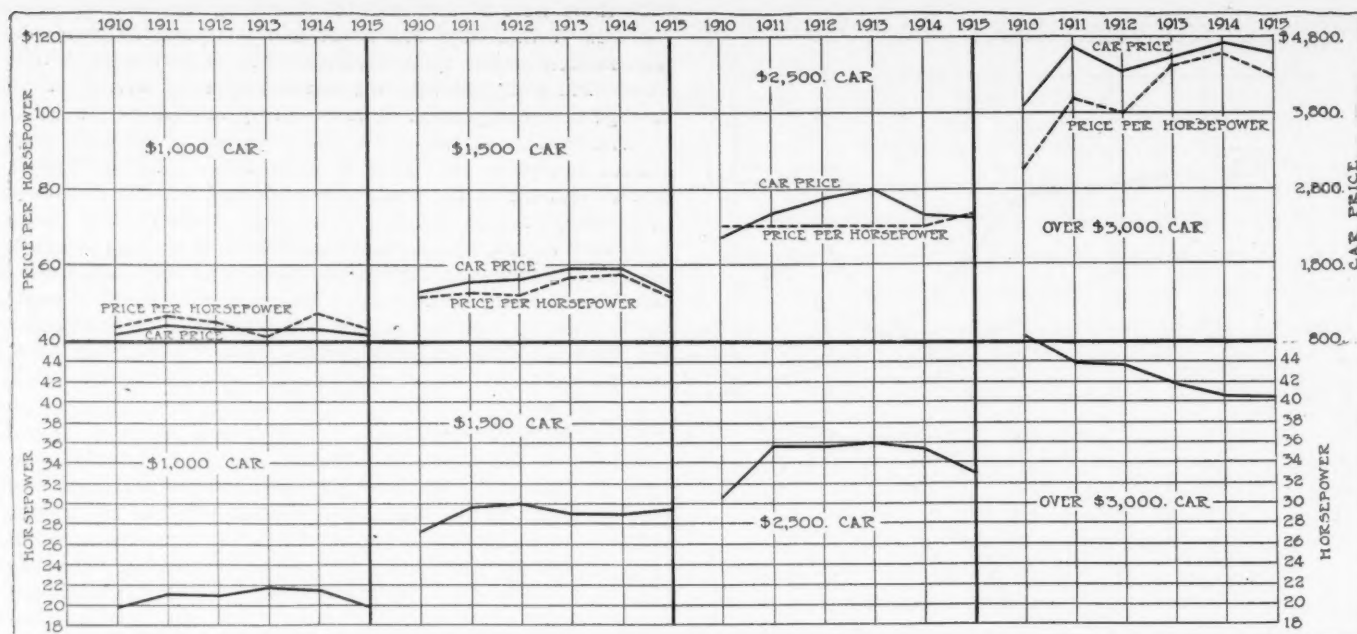
In analyzing the wheelbase trends in the \$2,500 car during the past 5 years there have been two pronounced periods of lengthening, first when the average increased 6 inches between 1910 and 1911 and again between 1912 and 1913 when 7 inches were added. The first increase was due to the general movement to build longer cars for riding comfort and the second between 1912 and 1913 was due entirely to the six-cylinder movement. The increase from year to year is shown in the following figures: 1910, 113 inches; 1911, 119 inches; 1912, 120 inches; 1913, 127 inches; 1914, 125.8 inches; and 1915, 126.6 inches.

The wheelbase of the average car listing at over \$3,000 has increased steadily for 5 years, jumping from an average of 124 inches in 1910 to 133.2 for 1915. In this period there has only been one perceptible increase, 5 inches, between 1911 and 1912, and since then it has steadily climbed up 1 inch per year. The 5-inch jump was due to the six-cylinder movement which in that year grew from practically zero to 44 per cent.

Tires Are Smaller

The increase in economy of the chassis while at the same time an increase in length has been made, indicates that steps must have been taken to lighten the weight and simplify the component parts. That this is so, is shown alone in the tire size, which is this season smaller than at any other time since 1911. It is now in the 1915 car 34 by 4 on the average chassis. For 1914 and 1913 the average tire size was 35 by 4.5. In 1912 it was 35 by 4. The tire size for 1910 and 1911 was 34 by 4 so that now we have come back to the tire size of 5 years ago. This was the day before the manufacturer fully equipped his car and it would now seem if unit tire weights are the same, that the added weight of electric equipment and the other comfort features throughout has been compensated for by the development of the other parts of the chassis.

Big changes in motor design have been made during 1914. Block castings have jumped to supremacy, sixes have still continued to gain, stroke-bore ratios have increased, L-head cylinders are now well in the lead, and bores are smaller and



CAR PRICE AND ITS RELATION TO HORSEPOWER

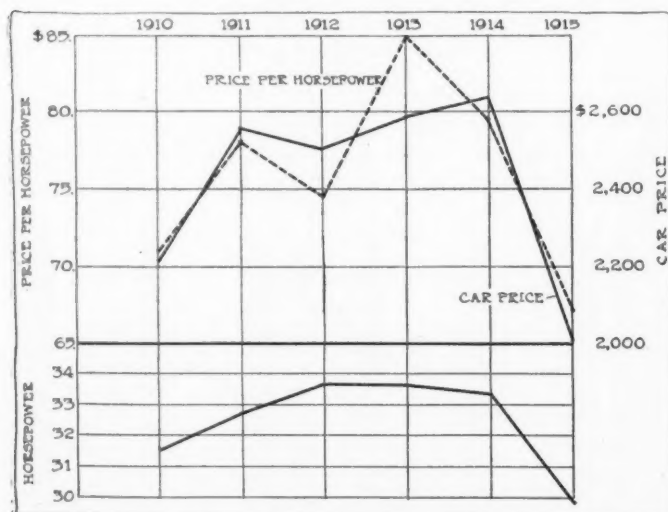
The price per horsepower in every class has been an uncertain factor for the last 5 years. Up to 1914 the trend was generally upward, the reason being that each year makers were compelled to charge more for the equipment that they added. For 1915 this has undergone a change, and now the unit price is lower than a year ago.

strokes about the same length. In the motor auxiliaries mountings have been simplified, adjustment points are more accessible, carbureters are higher.

In the motor systems: cooling, ignition, lubrication and cranking, many detail improvements may be noted. Thermo-syphon is on the increase, pump circulation has dropped due to the influx of low-priced cars using thermo-syphon. Air-cooling is only used by Franklin. The single ignition system is rapidly ascending the scale of popularity, displacing the dual. Pressure oiling is growing with the use of the high-speed motor and electric cranking and lighting systems are lighter, more efficiently connected, simpler and have better electrical characteristics than a year ago.

Average Horsepower Less

While chassis have universally been increasing in length since 1910, motor sizes have risen to their highest point in the years of 1912 and 1913 and are now on the descending scale.



PRICE DEFLECTION AND HORSEPOWER

Car selling price reached its zenith in 1914, after a steady upward trend since 1910, and yet the drop on the average car has been so great during the past year that for 1915 the average selling price is lower than at any time in the last 5 years.

The trends of motor design are discussed under a separate head, but what manufacturers of cars are doing in a general way should be mentioned here.

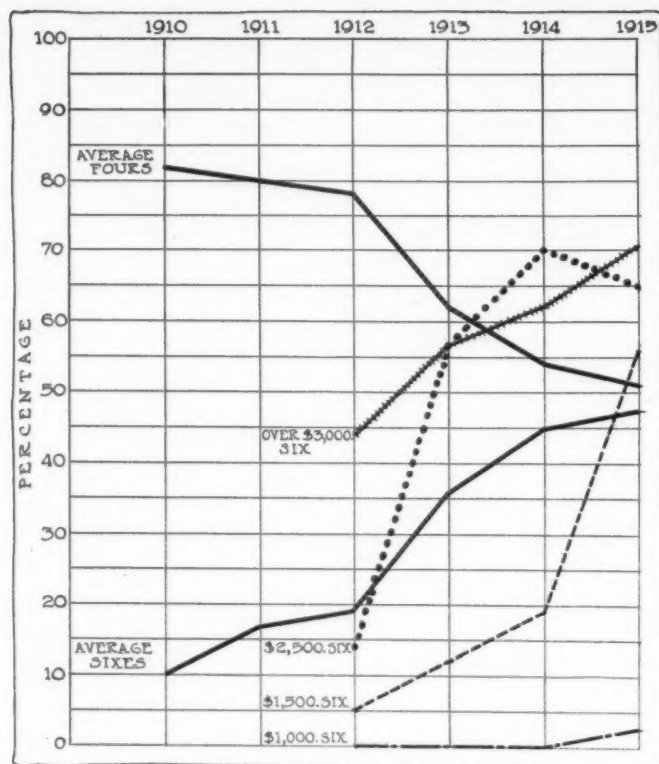
The highest average horsepower reached by all manufacturers is 33.6 and these figures held good for the years of 1912 and 1913. In the 2 years since then, it has fallen to 33.2 in 1914 and 29.97 for 1915. It would be expected that since the prices of cars are on the whole lower, the average horsepower of the cheaper cars would be more, but the contrary is true, and the only car which has risen in horsepower is that in the \$1,500 class.

Horsepower figures for the \$1,000 car show a rise from 1910 to 1913 of from 19.85 to 21.86; in 1914 the figure was 21.4 and in 1915 the drop has been accentuated by a fall to 19.78. In this price class the drop can be accounted for by the addition of the miniature car. A year ago, there were many cyclecars. These have passed and in their place we find the development of another class of car which may be known as the miniature. It is replete with many of the comfort features of the larger cars but it is small in size and has a motor with a bore which is in such examples as the Saxon six, the Grant six and in fours made by these two concerns and others such as Scripps-Booth, Remington, Rayfield, and Vixen under 3 inches. The examples of the two sixes, the Grant at \$750 and the Saxon at \$785, mark the commencement of a new era in motor characteristics in cars of this price.

Cars of \$1,500 have an average of 29.01 S. A. E. horsepower for 1915 as compared to 28.6 for 1914. The reason is in the large increase in sixes in this price class. The highest point in horsepower in cars of this class was in 1912 when it was above 30, being 30.01. This was the culmination of a rise from 27.20 in 1910 to 29.53 in 1911.

In the \$4,000 price class there has been practically no horsepower variation for 1914 and 1915. These figures being respectively 40.50 and 40.22. Unlike in any other price class, the highest horsepower was in 1910 and since that time the curve of S. A. E. horsepower has shown a steady downward tendency, losing a little each year as will be noted from the chart.

The coming season marks the introduction of the six into the low-price field and Grant and Saxon are the pioneers. On the whole the six has gained ground, having risen from 45



NUMBER OF CYLINDERS

The six has been gaining ground steadily since 1910. The four has correspondingly fallen off in percentage and the curves are practically complementary. In the price classes the six has risen everywhere, being now even in the \$1,000 class

per cent. in 1914 to 47.5 in 1915. The gains of the six through the various years will be discussed under motors, but in the different priced classes it may be mentioned here that it has gained everywhere except in cars selling for \$2,500. The gain in the \$1,500 class has been most marked. In 1914, but 19 per cent. of \$1,500 cars were sixes, now more than half or a percentage of 55 are sixes. In 1912 the six was introduced into the \$1,500-class in the same way that the six is now being introduced into the \$1,000 class. It made its entrance with 5 per cent. and in 1913 this had risen to 12. Another 7 per cent. was gained in 1914, bringing it up to 19 per cent. This year has come the landslide and now there are but 40.2 per cent. which are fours and in addition to this the entering wedge of the eight has appeared. The eights are in the number of 4.1 per cent.

A drop of 5 per cent. in sixes has occurred from 1914 to 1915 in the \$2,500 class. In 1914, 70 per cent. of all the \$2,500 cars were sixes and 30 per cent. fours. This year the 1915 season opens with 65 per cent. sixes, 33.3 per cent. fours, and 1.7 per cent. eights. The drop in percentage of sixes in the \$2,500 class is not due to a drop in popularity of the six, because if that were so it would be shown in the average figures for all classes. The number of makers of \$2,500 cars, however, has dropped from 60 to 42 and as will be noted in the examples mentioned under the head of motors, a large number of the concerns which have been eliminated were manufacturers of sixes in this class.

Fewer Expensive Cars

Among makers of expensive cars, the falling off in numbers has been greater than any other, but in spite of this the percentage of sixes has grown. It must be remembered that a large proportion of the cars listed in this price class are on chassis which would sell in a lower-priced class were they fitted with touring or roadster bodies. Sixes are used on 70.5 per cent. of the \$4,000 cars. The rise since 1912 has been continued. In that year there were 44 per cent. using the six, in

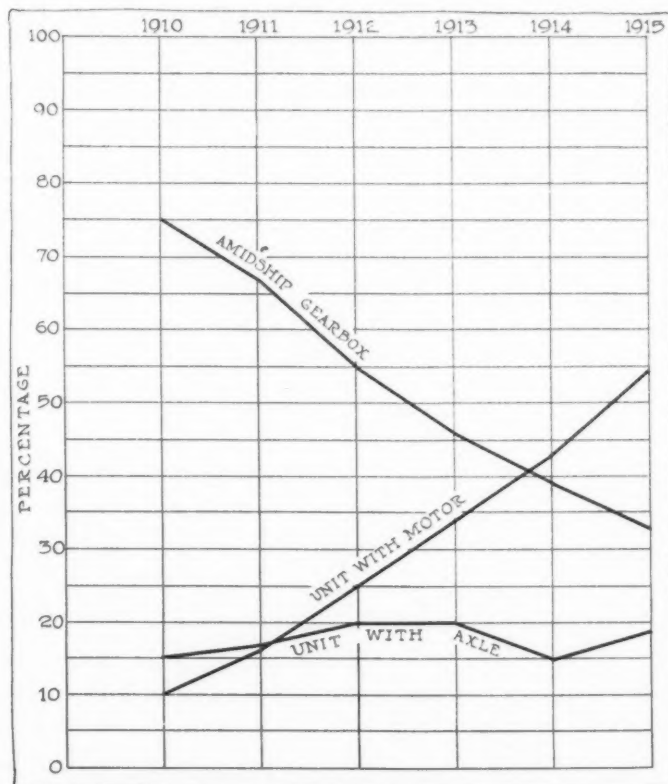
1913 there were 57 and in 1914, 62. Thus the curve of sixes for cars of this class has never had a depression since the introduction of this type of motor. The eight is also in this class when equipped with the inclosed types of bodies. Percentage is not important however, being but 1.5.

Developments in the entire drive system do not show any radical change in the types of units used. The percentage of disk clutches is the same now as it was in 1911 and very little change has taken place during this lapse of time. The same may be said of cone clutches and working back through the gearbox, driveshaft and final drive, it is only in the rear axle and suspension that the changes are of great enough degree to attract more than passing attention. Yet throughout the entire transmission system, gains in efficiency have been made.

Disk Clutch in Majority

Only in 1 year, 1912, was the majority of cars equipped with a cone clutch, but the percentage of cone as compared with disk has always been close. In 1912 52 per cent. were equipped with cone clutches and 44 per cent. had disks. In 1915, 51 per cent. have disks and 44 per cent. cones. The difference between these figures and 100 per cent. is made up by the small percentage that use the expanding and contracting band type or that have no clutch at all, such as the Cartecar, Lambert and Metz with friction drive or the Owen with its electro-magnetic transmission.

Clutches in themselves have been improved. It must be remembered that the broad classification of disk clutches includes many minor types that differ quite widely in their use. The disk-in-oil with its many plates is not like the dry-plate type with its fewer plates or like the three-plate type which is clearly described by its name. The dry-plate clutch has gained in percentage over the disk-in-oil since 1910, but during the last 2 years has remained nearly stationary. Improvements in the engaging springs, making them gradual



GEARBOX LOCATION

Unit power plants have gone up steadily and amidship gearboxes have dropped steadily since 1910. The other classification, that of the axle unit, has zigzagged between 15 and 20 per cent. during the 5 years

and yet eliminating slip which was the early enemy of the disk-in-oil clutch, have been consummated during the past 3 years. There has been a tendency towards dividing the clutch spring into three parts, making a more uniform distribution of the spring load.

Little Change in Cones

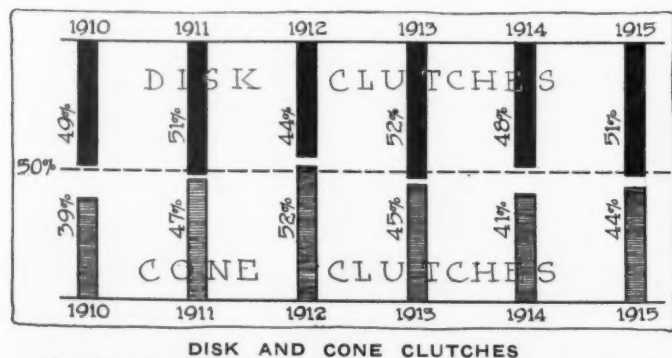
In cone clutches little change has been made during the year and where it has been made it is in the direction of easy engagement or accessibility. Marmon, for instance, has introduced the circular disk spring beneath leather, and Empire has improved the assembly so that the average driver may adjust the tension on the clutch spring without trouble. Diameters of clutch cones have not changed on the average installation, but the faces are inclined to be slightly wider, giving a greater bearing surface for the leather. The pressed steel cone is in the ascendancy. Cadillac has changed from cone to disk and McFarlan from disk to cone.

The expanding band clutch has fallen off since 1914, but the difference in percentage is very slight being .5 as compared to 3 per cent. Peerless continues to use it on one model and is the last remaining devotee of this design. The contracting band is still used on 4.5 per cent. and has lost but .5 per cent. since 1914, when it was higher than at any time of which there is previous record. In 1910 3 per cent. used contracting-band clutches and 6 per cent. used the expanding band. Percentage of contracting-band dropped to 1 per cent. for 1911 and 1912 and 2 per cent. in 1913. The makers who employ the contracting-band clutch are Apperson and Haynes.

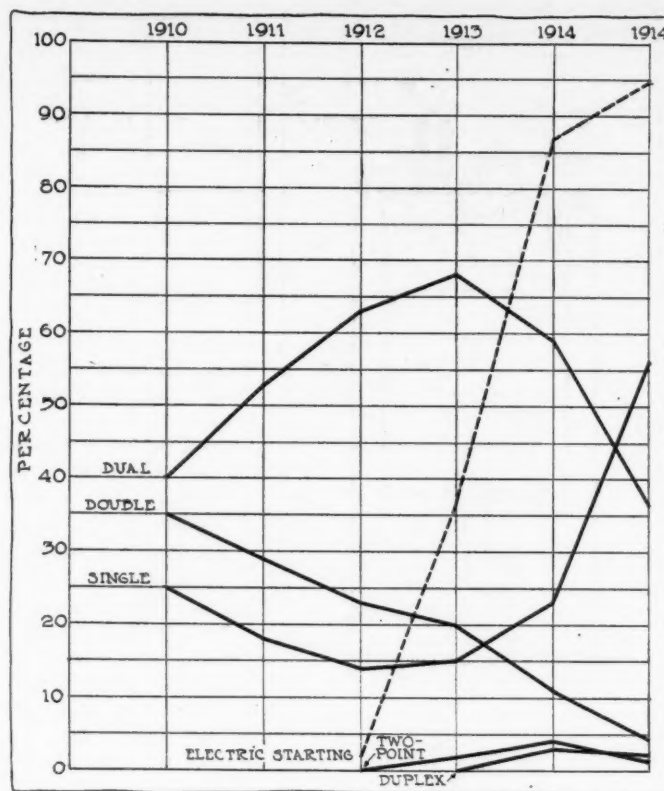
Center Control Aids Simplicity

In gearset design no radical changes can be said to have been made during the past year. With the introduction of center control on the large percentage of our cars it has been possible to greatly simplify the linkage which connects the gearshifting lever to the gearbox. On center control cars it is now common practice to mount this lever directly on the gearbox cover and thus avoid the bell cranks and shafts which were necessary with the side levers. Gear faces are almost universally wider, although the material in the gearbox has improved. This combination of wider toothfaces and better material has had a great effect on the increase of life of the gearbox. It has also tended to make it noiseless. The throw of the gearshifter lever in making changes, is less than it was. This is due to shorter shafts in the gearbox to secure the maximum stiffness and to avoid changes in alignment.

The location of the gearbox is an interesting study. Ever since 1910 the percentage of those using the amidship location has steadily decreased and the chart indicates that this decrease has been practically uniform. Starting with a record of 75 per cent. of all the installations in 1910, the drops during the succeeding years have been to 67, 55, 46, 39 until 1915 when it is 32.5. In almost inverse ratio the unit power



DISK AND CONE CLUTCHES
The fight for supremacy between the disk and cone clutch has resulted in a practical deadlock since 1910. As will be noted from the curve, cone clutches were over the 50 per cent. line but once, whereas disk clutches have passed it three times.



IGNITION FLUCTUATIONS

Dual ignition was gaining ground until 1913, when the rapid introduction of electric starting caused the falling off of its progress and the growth of the single system.

plant has been increasing; whereas, in 1910 it was only used in 10 per cent., it has steadily increased until in 1915 the figure is 49.3 per cent. In 1911 it was 16; in 1912, 25.

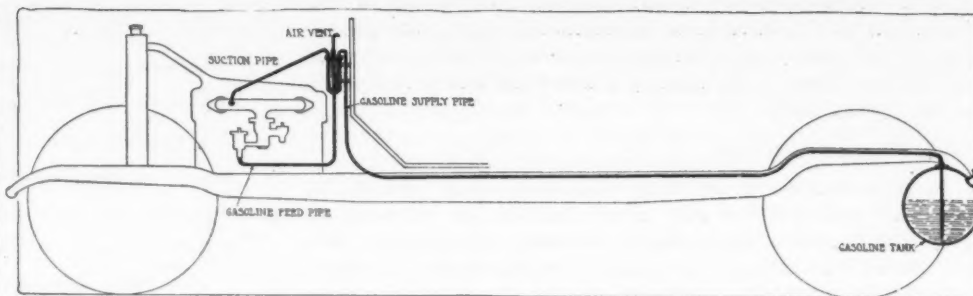
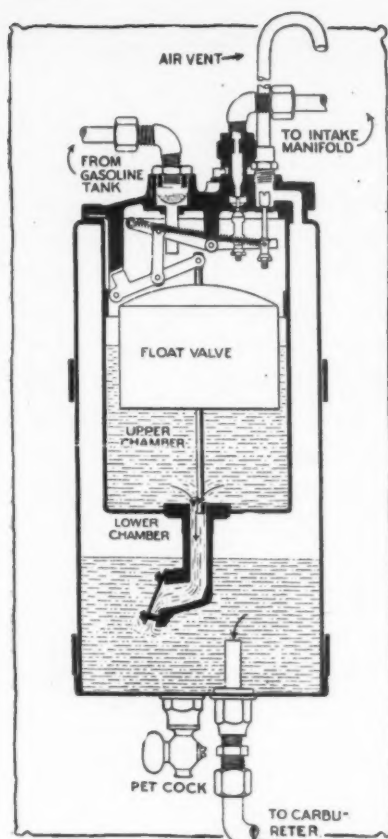
The percentage of cars using the gearbox in a unit with the axle has not varied much in the past 5 years. In 1910 it was 15 per cent. and in 1915 it is 18.2 per cent. In the interim it has been up as high as 20 per cent. which position it held for the years of 1912 and 1913, but in 1914 it was at its lowest since 1910, being 15 per cent. In other words it is again on its way towards a more popular position, having gained 3.2 per cent. during the past year. This is due in part to the discontinuance of a few concerns that used other gearboxes and also to its adoption by Chalmers, Mitchell, Saxon, Trumbull, Twombly and Vixen. On the other hand Maxwell, Studebaker and Velie have abandoned it.

Unit Power Plant Gains

There is no doubt that the unit power plant and the block-cast motor which has gained substantially in popularity during the past year are complementary effects of the same trend. Three-point suspension is another effect of making the entire motor in one single unit in conjunction with the housing for the gearbox and clutch. This use of a flexible support which is independent of frame stresses finds favor on 90 per cent. of the block-cast motors.

Four-speed gearboxes reached their highest percentage in 1914. In this year 29.5 per cent. were so equipped. For 1915 the percentage has dropped to 23.5, a loss of 6 per cent. of the installations, giving a corresponding gain for the three-speed of 7 per cent. Those who have abandoned the four-speed gearbox during the year are Austin, Cameron, Interstate, Kline, Moon and Rayfield. In addition several who used it are now out of business, for example, American, Correja and Vaughan. Friction drive and two-speed gearboxes have lost ground. This is in line with a steady development of trend since 1910.

Floating axles, while not as popular as 2 years ago are still



VACUUM FUEL FEED SYSTEM

Vacuum feed is one of the infant prodigies of the past year, having grown from an unrecognized factor in 1914 to more than 20 per cent. for 1915. Its introduction has caused a marked rearrangement in tank locations

used on more chassis than all other types together. The curve of popularity has had a rise and fall. Starting in 1912 with 50 per cent., the figure for 1913 was 67 per cent., for 1914, 65 per cent. and for 1915, 56.5 per cent. The high spot was 1913. The reason for the falling off in popularity of the floating axle is in the introduction of a

In other words an adjustment which would be very bad in the straight bevel type would be perfectly quiet in the helical, due to the gradual engagement of the teeth as compared with the shock engagement with the straight bevel. On the whole, tests show that the helical bevel is just as efficient under all conditions as the straight bevel. The reason that the helical gear is an improvement is that in the straight tooth bevel gear any given tooth goes into or out of mesh at one time along its entire length. In the spiral-bevel the meshing starts

large number of low-price cars. The floating construction is more expensive to manufacture and the lower-priced cars as a rule use the other designs.

Semi-floating axles have decreased in popularity steadily since 1912, having traveled down the scale from 49 per cent. to 23 per cent. The percentages year by year were: 1912, 49; 1913, 26; 1914, 17 and 1915, 23.

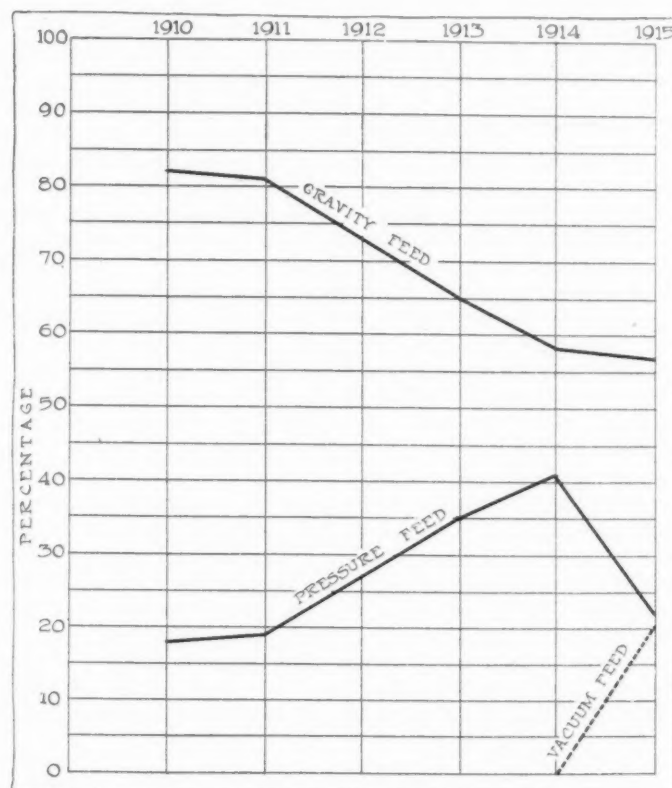
Three-Quarter Floating Axle Coming

The three-quarter floating axle has grown in favor from 4 per cent. in 1913, when it was introduced, to 18.5 per cent. in 1915. It has found favor on the medium-price cars because it offers the desired amount of bearing surface for the rear wheels, is accessible and at the same time is cheaper to manufacture than the floating design.

With alterations in axle design, a change has begun to make itself felt in the arrangement of the final drive. The spiral bevel rear axle has increased from 1 per cent. in 1914 to 9.5 per cent. in 1915. Worm drive has increased from 1 to 1.5 per cent. and chain drive from 4 to 4.5 per cent. These upward trends have cut into the numbers of those using the orthodox shaft and bevel with the result that in place of the 93 per cent. of makers who had cars so driven in 1914, only 84.5 per cent. have the bevel drive for 1915.

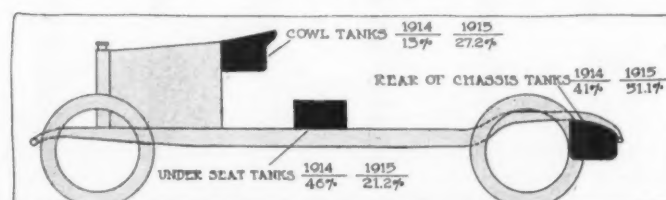
Spiral-Bevel a New Factor

Following Packards lead of a year ago the spiral-bevel drive has met with immediate favor. It has been now adopted by concerns such as Hudson, Cadillac, Reo, Speedwell, Marmon, Jeffery, Winton, Peerless, Stearns, Singer, Crawford, Cunningham, Dorris, Franklin and Kline. The difference in efficiency between the spiral-bevel and the straight bevel gear is so small that none of the makers who have adopted it think the power sacrificed to gain silence is sufficient to even reckon among the serious power losses in the car. Some state that the spiral-bevel is about 2 per cent. less efficient than the straight bevel under loads ranging from 8 to 45 horsepower. In addition to the silence, another advantage which is claimed for the spiral gear is that it does not require as careful handling in the matter of adjustments.



FUEL FEED SYSTEMS

Gravity feed has lost ground since 1910. Pressure gained since 1910 in the same proportion until the introduction of vacuum feed in 1914 caused a falling off in its popularity



TANK LOCATION ARRANGEMENTS

Vacuum feed is responsible for the changes in tank location. To show its effect the figures for 1914 and 1915 are given in the diagram above

at one end of the given tooth and gradually moves toward the other end and the unmeshing does the same. There are at least two helical teeth in partial mesh all the time.

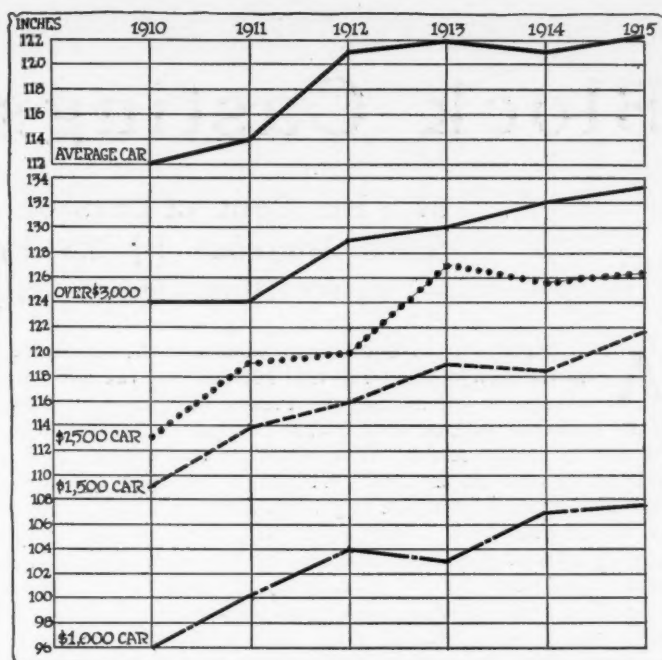
The problems of body room and clearance brought up by the overhead and under worm are not met with in the spiral-bevel, which takes up no more room than the straight bevel.

Outside of the axle construction of the rear system the materials employed have also, especially on the higher-priced cars, undergone a change for the better. The cars for 1915 are using more vanadium and chrome-nickel steel in the gears, not only in the gearset but in the differential, than any previous years. Nickel-steel shafts for the main drive and for the axles are also stronger than ever before, giving the car greater life. Broader bearing and tooth surfaces are also universal. Tubular drive shafts are now used on many cars; for example: Velie, Jeffery, Oakland, Hudson, Pierce, Peerless, Winton, Cunningham, Stearns, Dorris, Lexington, Moyer and Premier. Nearly all these are new.

Fifty-two Have Spring Drive

The method of taking the propulsion of the car and its suspension have changed together. Fifty-two manufacturers making ninety-five chassis drive through the spring. This is a percentage of 48. Following this in popularity in the manner of taking the drive is the torque tube which is used on 26 per cent. Radius rods take the drive in 26 per cent. and the torque arm in 6 per cent. Eighteen manufacturers, or 15

(Continued on page 1270)



VARIATIONS IN WHEELBASE LENGTH

Wheelbases have increased almost uniformly in every price class. In the average car they are 122 inches for 1915

Comparison of Features of the Average American Car for 5 Years

| General Averages | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 |
|--------------------------------------|---------|---------|---------|---------|---------|---------|
| Horsepower, S. A. E. ratings..... | 29.97 | 33.2 | 33.69 | 33.60 | 32.7 | 31.5 |
| Bore..... | 3.82 | 4.12 | 4.19 | 4.34 | 4.42 | 4.85 |
| Stroke..... | 5.10 | 5.28 | 5.15 | 4.97 | 4.46 | 4.68 |
| Stroke-bore ratio..... | 1.33 | 1.28-1 | 1.23-1 | 1.09-1 | 1.01-1 | 1.03-1 |
| Piston displacement..... | 397.38 | 349 | 345 | 316.2 | 313.2 | 281.5 |
| Wheelbase..... | 120.89 | 121 | 122 | 121 | 114 | 112 |
| Gear ratio..... | 3.88-1 | 3.6-1 | 3.57-1 | 3.62-1 | ..... | ..... |
| Tires..... | 34x4 | 35x4 | 35x4 | 35x4 | 34x4 | 34x4 |
| Number cars..... | 535 | 697 | ..... | ..... | ..... | ..... |
| Number chassis..... | 209 | 236 | 339 | 381 | 393 | 364 |
| Number makes..... | 119 | 133 | 156 | 193 | 270 | 239 |
| Price..... | \$2,005 | \$2,635 | \$2,585 | \$2,508 | \$2,560 | \$2,214 |
| PERCENTAGE | | | | | | |
| Number of Cylinders | | | | | | |
| One cylinder..... | 0 | 0 | 0 | 1 | 1 | 5 |
| Two cylinders..... | .5 | 1 | 1 | 1 | 2 | 3 |
| Four cylinders..... | 51.0 | 54 | 62 | 78 | 80 | 82 |
| Five cylinders..... | 0 | 0 | 1 | 1 | 0 | 0 |
| Six cylinders..... | 47.5 | 45 | 36 | 19 | 17 | 10 |
| Eight cylinders..... | 1.0 | 0 | 0 | 0 | 0 | 0 |
| Shape of Cylinders | | | | | | |
| T-cylinder type..... | 16.5 | 30 | 31 | 30 | 22 | 20 |
| L-cylinder type..... | 70.0 | 59 | 56 | 55 | 80 | 56 |
| I-cylinder type..... | 8.5 | 6 | 9 | 9 | 14 | 18 |
| Knight type..... | 3.0 | 3 | 3 | 2 | 1 | 0 |
| Two-cycle..... | 1.0 | 1 | 1 | 4 | 3 | 6 |
| Mondex-Magic type..... | 0 | 1 | 0 | 0 | 0 | 0 |
| Cylinder Arrangement | | | | | | |
| Cylinders cast separate..... | 4.0 | 6 | 15 | 22 | 28 | 39 |
| Cylinders cast in pairs..... | 27.0 | 42 | 48 | 58 | 69 | 53 |
| Cylinders cast in block..... | 67.5 | 39 | 29 | 18 | 12 | 8 |
| Cylinders cast in threes..... | 10.5 | 13 | 8 | 2 | 0 | 0 |
| Cooling | | | | | | |
| Air-cooled..... | .5 | 2 | 4 | 5 | 6 | 7 |
| Thermo-syphon..... | 27.0 | 19 | 17 | 19 | 28 | 23 |
| Pump circulating..... | 72.5 | 79 | 79 | 76 | 66 | 70 |
| Ignition Systems | | | | | | |
| Single ignition..... | 56 | 23 | 15 | 14 | 18 | 25 |
| Dual ignition..... | 36 | 59 | 68 | 63 | 53 | 40 |
| Two-spark ignition..... | 1.45 | 4 | 2 | 0 | 0 | 0 |
| Double ignition..... | 4.55 | 11 | 15 | 23 | 29 | 35 |
| Duplex ignition..... | 2.0 | 3 | 0 | 0 | 0 | 0 |
| Motor Lubrication | | | | | | |
| Splash oiling..... | 46.5 | 42 | 53 | 68 | 81 | 0 |
| Splash-pressure oiling..... | 16 | 39 | 32 | 20 | 0 | 0 |
| Oil in fuel..... | 0 | 1 | 1 | 2 | 3 | 6 |
| Pressure oiling..... | 37.5 | 18 | 14 | 10 | 19 | 0 |
| Engine Starting | | | | | | |
| Electric starter..... | 94.5 | 87 | 37 | 2 | 0 | 0 |
| Acetylene starter..... | 0 | 1 | 14 | 0 | 0 | 0 |
| Air starter..... | 0 | 4 | 9 | 2 | 1 | 1 |
| Optional starter..... | 1.5 | 2 | 5 | 0 | 0 | 0 |
| Mechanical starter..... | .5 | 1 | 4 | 0 | 0 | 0 |
| No starter as stock..... | 3.5 | 5 | 31 | 98 | 99 | 99 |
| General Averages | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 |
| Fuel Feed | | | | | | |
| Gravity fuel feed..... | 57 | 58 | 65 | 0 | 81 | 82 |
| Gravity-pressure fuel feed..... | .5 | 1 | 0 | 0 | 0 | 0 |
| Pressure fuel feed..... | 22 | 41 | 35 | 0 | 19 | 18 |
| Vacuum feed..... | 20.5 | 0 | 0 | 0 | 0 | 0 |
| Gas Tank Location | | | | | | |
| In cowl..... | 27.2 | 13 | ..... | ..... | ..... | ..... |
| At rear..... | 51.1 | 41 | ..... | ..... | ..... | ..... |
| Under seat..... | 21.2 | 46 | ..... | ..... | ..... | ..... |
| Type of Clutch | | | | | | |
| Disk clutch..... | 51 | 48 | 52 | 44 | 51 | 49 |
| Cone clutch..... | 44 | 41 | 45 | 52 | 47 | 39 |
| Expanding band clutch..... | .5 | 3 | 1 | 3 | 2 | 6 |
| Contracting band clutch..... | 4.5 | 5 | 2 | 1 | 1 | 3 |
| None..... | ..... | 3 | ..... | ..... | ..... | ..... |
| Type of Gearset | | | | | | |
| Selective..... | 91.5 | 95 | 94 | 92 | 90 | 85 |
| Progressive..... | 3.5 | 1 | 2 | 5 | 1 | 8 |
| Planetary..... | 1.0 | 1 | 1 | 2 | 4 | 4 |
| Friction..... | 2.5 | 3 | 3 | 1 | 5 | 3 |
| Location of Gearset | | | | | | |
| Amidship..... | 32.5 | 39 | 46 | 55 | 67 | 75 |
| Unit with axle..... | 18.2 | 15 | 20 | 20 | 17 | 15 |
| Unit with motor..... | 49.3 | 43 | 34 | 25 | 16 | 10 |
| None..... | ..... | 3 | ..... | ..... | ..... | ..... |
| Steering and Control | | | | | | |
| Right steering right control..... | 9.5 | 24 | 58 | 70 | 81 | 93 |
| Right steering center control..... | 3 | 10 | 13 | 15 | 11 | 4 |
| Left steering center control..... | 79.5 | 57 | 25 | 13 | 6 | 2 |
| Left steering left control..... | 3.5 | 2 | 4 | 2 | 2 | 1 |
| Optional steering..... | 4.0 | 4 | 0 | 0 | 0 | 0 |
| Electric gearshift (left steer)..... | 0 | 3 | 0 | 0 | 0 | 0 |
| Wheels | | | | | | |
| Wire wheels, demountable..... | 7.0 | 4 | 3 | 0 | 0 | 0 |
| Wood wheels..... | 88.5 | 96 | 96 | 100 | 100 | 100 |
| Optional..... | 4.5 | 0 | 0 | 0 | 0 | 0 |
| Final Drive | | | | | | |
| Shaft and bevel..... | 84.5 | 93 | 94 | 92 | 91 | 89 |
| Chain..... | 4.5 | 4 | 4 | 6 | 8 | 11 |
| Shaft and worm..... | 1.5 | 1 | 1 | 1 | 0 | 0 |
| Roller..... | 0 | 1 | 1 | 1 | 1 | 0 |
| Shaft and worm-bevel..... | 9.5 | 1 | ..... | ..... | ..... | ..... |
| Type of Axle | | | | | | |
| Floating..... | 56.5 | 65 | 67 | 50 | 0 | 0 |
| Semi-floating..... | 23.0 | 17 | 26 | 49 | 0 | 0 |
| Three-quarter floating..... | 18.5 | 14 | 4 | 0 | 0 | 0 |
| Seven-eighths floating..... | 0 | 1 | 0 | 0 | 0 | 0 |
| Dead rear axle..... | 2.0 | 3 | 3 | 1 | 0 | 0 |
| Timing Gear Drive | | | | | | |
| Spur gear..... | 16.1 | 13 | 83 | ..... | ..... | ..... |
| Helical or spiral gear..... | 73.7 | 77 | 10 | ..... | ..... | ..... |
| Silent chain..... | 9.1 | 10 | 7 | ..... | ..... | ..... |
| Worm..... | 1.1 | 0 | 0 | 0 | 0 | 0 |

Block Castings the Big Trend

67.5 Per Cent. of Cars on Market Use Block Types—
Sixes Increase by 2.5 Per Cent.—I-Heads Gained
—Stroke-Bore Ratio Higher—Horsepower Lower

AN avalanche towards block-cast motors is the feature of motor development for this season. Of the 200 odd chassis on the market this season, 67.5 per cent. have their cylinders formed in a single casting as compared to 39 per cent. last season. The result of this change is exhibited all through the car. Without an increase in wheel-base makers have been able to provide more body space, owing to the shorter hood. The opportunity for inclosing every moving part of the motor afforded by the block casting has been taken advantage of to simplify the exterior. Coupled with the increase in unit power plants and three-point suspensions, the block-cast tendency has resulted in the adoption of a compact unit in which the clutch and gearbox housing are a part of the crankcase and in which all four or six cylinders are in one piece.

Some of the notable concerns who have adopted or returned to block casting in some models, during the year, are: Overland six, Chalmers six, Cole six-50, Enger six, Haynes, Norwalk, Peerless, Pullman, Stearns, Stutz and Velie. In addition to these there are a large number who have gone over to the block type of casting in one or two models, making their entire line block-cast. Apperson, Austin, Lenox and Moon are examples of this. Another reason for the growing percentage of blocks is that a large number of the new makers

who have entered the field have used the block method of casting. Dodge and Scripps-Booth, who has abandoned the cyclecar, are two examples.

Block Sixes Increase

It is in the six-cylinder motor that the increase of block castings is the most remarkable. A year ago some makers were inclined to be dubious of the six-cylinder block casting, believing that it was apt to be of inferior workmanship and consequently would result in an increased percentage of scrapped material. The improvement of foundry work has done much toward eliminating this fear, and consequently pair castings have fallen from 42 per cent. in 1914 to 27 per cent. in 1915 and casting in threes has also dropped from 13 per cent. to 10.5 per cent. In proportion six-cylinder blocks have risen from 45 to 63 per cent. during 1914.

In cylinder shapes the trends noticed in 1914 have been accelerated. In place of the gradual dropping off of T-head cylinders from 31 in 1913 to 30 per cent. in 1914; a quick fall to 16.5 per cent., has resulted from the marked gain of the L-head cylinder and also from the slight gain of the valve-in-head motor. For 1915, 70 per cent. of our motors have L-head cylinders, a fact not a little accounted for by the adoption of the block design. The L-head lends itself better to this method of casting than any other and these two developments have gone hand in hand until they now are the most distinguishing features of American design.

I-Heads Increase

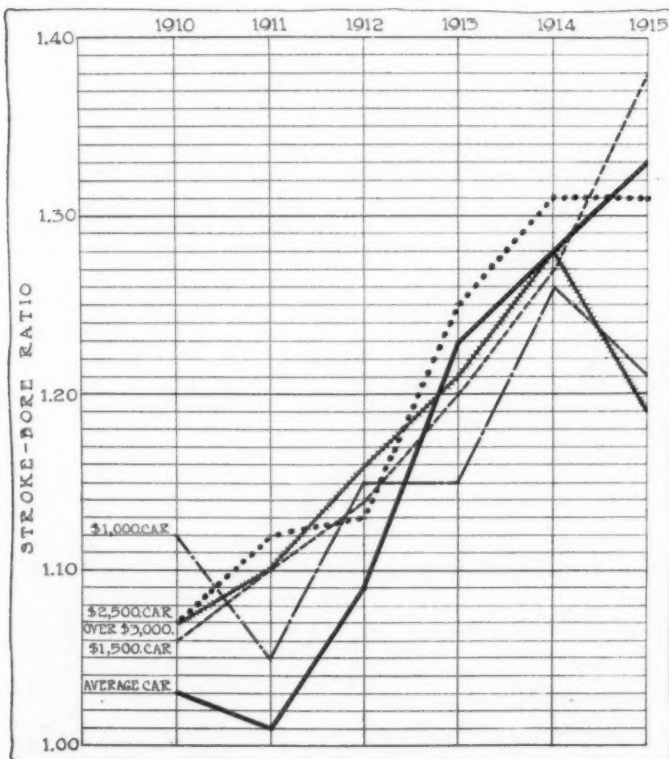
The bulwarks of I-head construction continue to be such concerns as Buick, Franklin, Chevrolet, and Dorris, whose entire line is so constructed. Only two have dropped out. These are the Knox Automobile Co., and Cameron and they may not be out long. In addition to those who have had valve-in-head motors for the past few seasons there are new recruits who are instrumental in bringing the percentage up to its 2.5 per cent. gain. Among these may be mentioned Chalmers, Olds, Partin, Grant, Kearns, Owen and F. R. P. The total percentage of I-head motors is 8.5 as against 6 for 1914.

A 25 per cent. increase in valve-in-head construction gives rise to the question as to whether or not we are on the threshold of a marked change to this style of motor. The practice of overhead camshaft in connection with the valve-in-head motor has driven its entering wedge into the industry. The Weidely motor now sold for the trade and the new F.R.P. are two examples.

But all the developments in motors are not brought out in percentage tables. The growth of the long-stroke, high-speed powerplant is increasing. The stroke-bore ratio of American motors has risen in steady steps since 1911. At that time it was 1.01 to 1, now it is 1.33 to 1 on the average car.

Longest Stroke 7 Inches

Mitchell-Lewis and Pierce bear the distinction of having the motors with the longest stroke, this dimension being 7 inches. Fiat follows with 6.69 inches. There are several motors with 6-inch stroke among whom may be mentioned Peerless and Moline. Perhaps the most radical change in motor specifications is in the Inter-State which went from a six-cylinder 4 by 5 in 1914 to a four-cylinder 3.5 by 5 for



Above set of curves shows the general upward trend of stroke-bore ratios during the past 5 years. The average car has increased in stroke-bore ratio steadily since 1911, but those in the different price classes have risen and fallen during this period. The general upward trend, however, will be noted from the inclination of the average curve

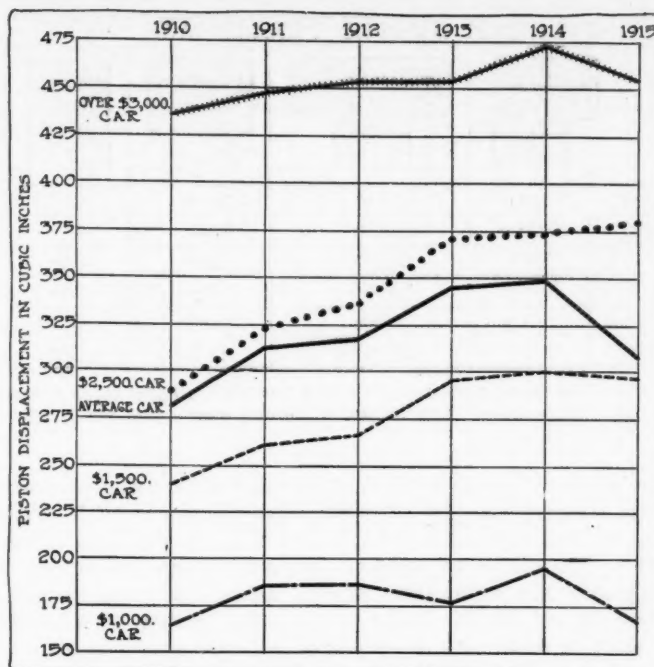
1915. The greatest stroke-bore ratio is that in the 4 by 6 cars which is 1.66.

In spite of the increase in stroke-bore ratios the square motor is not a thing of the past. One of our big-output manufacturers Buick, still continues to market a 3.75 by 3.75. There are no automobile companies listing motors with the stroke shorter than the bore. A big factor in the increased stroke-bore ratio is the gain in popularity of the 3.5 by 5 motor. This is used in 12 per cent. of our chassis, both fours and sixes. In 1914 it was only used in 4 per cent.

This lengthening of the stroke is not the only factor that has changed since the inception of the high-speed type. Lighter reciprocating weights have been such an object in motor design that it may be said conservatively that 5 per cent. has been cut from the weights of piston and connecting-rod assemblies.

The S. A. E. horsepower of the American motor for 1915, when taking the average of the entire gamut of cars, is 29.97. In 1914 it was 33.2, and yet were the formula neglected and the dynamometer test substituted as the judge of power, the 1915 motor with its smaller bore and greater stroke-bore ratio would doubtless outrank those of the past two seasons. It is certain that with its better balance and lighter parts that vibration would be found to be greatly reduced and the motor life correspondingly lengthened.

The figures for piston displacement reached their zenith in 1914. At that time the average American motor had a



Piston displacement has fallen off in every car except in the \$2,500 range. Here it has gone slightly upward.

Motor Characteristics in the Different Price Classifications for the Past 5 Years

| | \$1,000 CARS | | | | | | \$1,500 CARS | | | | | | \$2,500 CARS | | | | | | \$4,000 CARS | | | | | | |
|----------------------------|--------------|-------|-------|-------|---------|-------|--------------|---------|---------|---------|---------|---------|--------------|---------|---------|---------|---------|---------|--------------|---------|---------|---------|---------|---------|------|
| | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 | 1915 | 1914 | 1913 | 1912 | 1911 | 1910 | |
| Numbers | | | | | | | | | | | | | | | | | | | | | | | | | |
| Makes..... | 50 | 35 | 32 | 56 | 52 | 43 | 50 | 54 | 81 | 86 | 86 | 75 | 42 | 60 | 79 | 74 | 70 | 63 | 34 | 46 | 58 | 84 | 62 | 58 | |
| Chassis..... | 57 | 50 | 42 | 65 | 76 | 72 | 63 | 84 | 112 | 122 | 125 | 102 | 54 | 102 | 93 | 82 | 76 | 83 | 48 | 72 | 92 | 112 | 116 | 107 | |
| Cars..... | 100 | 60 | 76 | 130 | 136 | 114 | 122 | 130 | 238 | 257 | 298 | 174 | 126 | 170 | 235 | 216 | 234 | 159 | 187 | 247 | 359 | 525 | 395 | 230 | |
| Average | | | | | | | | | | | | | | | | | | | | | | | | | |
| S.A.E. H.P.... | 19.78 | 21.4 | 21.86 | 21.18 | 21.23 | 19.85 | 29.01 | 28.6 | 28.9 | 30.01 | 29.53 | 27.20 | 32.96 | 35.20 | 35.90 | 35.45 | 35.60 | 30.65 | 40.23 | 40.50 | 41.70 | 43.40 | 43.66 | 46.65 | |
| Bore, in..... | 3.52 | 3.72 | 3.75 | 3.78 | 4.01 | 3.79 | 3.78 | 4.07 | 4.18 | 4.26 | 4.19 | 4.14 | 4.03 | 4.23 | 4.40 | 4.43 | 4.31 | 4.45 | 4.46 | 4.63 | 4.65 | 4.87 | 4.76 | | |
| Stroke, in.... | 4.28 | 4.69 | 4.32 | 4.37 | 4.21 | 4.25 | 5.21 | 5.15 | 5.05 | 4.86 | 4.64 | 4.41 | 5.28 | 5.29 | 5.27 | 5.00 | 4.96 | 4.75 | 5.32 | 5.68 | 5.62 | 5.41 | 5.39 | 5.11 | |
| Ratio..... | 1.21 | 1.26 | 1.15 | 1.15 | 1.05 | 1.12 | 1.38 | 1.27 | 1.20 | 1.14 | 1.10 | 1.06 | 1.31 | 1.31 | 1.25 | 1.13 | 1.12 | 1.07 | 1.19 | 1.28 | 1.21 | 1.16 | 1.10 | 1.07 | |
| Piston disp.. | 166.7 | 195.0 | 178.0 | 186.2 | 185.8 | 164.5 | 296.4 | 300 | 295 | 266.5 | 262.0 | 238 | 380 | 378.5 | 372.0 | 336.5 | 324.2 | 287.9 | 454 | 474 | 453 | 453 | 447.3 | 436.5 | |
| Wheelbase, in. | 107.37 | 107 | 103 | 104 | 100 | 96 | 121.60 | 118.5 | 119 | 116 | 114 | 108 | 126.6 | 125.8 | 127.0 | 120.0 | 119 | 113 | 133.2 | 132 | 130 | 129 | 124 | 124 | |
| Tires, in..... | 32x34 | 32x34 | 32x34 | 32x34 | 32x34 | 32x34 | 34x4 | 34x4 | 34x4 | 34x4 | 34x4 | 34x4 | 35x4 | 35x4 | 36x4 | 36x4 | 35x4 | 34x4 | 36x4 | 36x5 | 37x5 | 36x4 | 37x5 | 36x4 | |
| Price..... | \$855 | \$950 | \$920 | \$954 | \$1,002 | \$879 | \$1,419 | \$1,650 | \$1,662 | \$1,595 | \$1,585 | \$1,430 | \$2,454 | \$2,460 | \$2,410 | \$2,470 | \$2,490 | \$2,140 | \$4,563 | \$4,700 | \$4,550 | \$4,350 | \$4,650 | \$3,917 | |
| Gear ratio..... | | | | | | | | 3.7-1 | 3.6-1 | | | | | | | | | | | | | | | | |
| Percentage | | | | | | | | | | | | | | | | | | | | | | | | | |
| Six cyl..... | 3.5 | 0 | 0 | 0 | | | 55.7 | 19 | 12 | 5 | | | 65 | 70 | 57 | 14 | | | 70.5 | 62 | 57 | 44 | | | |
| Four cyl..... | 94.8 | 89 | 81 | 87 | | | 40.2 | 81 | 88 | 95 | | | 33.3 | 30 | 43 | 86 | | | 28.0 | 38 | 42 | 55 | | | |
| Two cyl..... | 1.7 | 11 | 19 | 10 | | | | 0 | 0 | 0 | | | | | | | | | | | | | | | |
| Eight cyl..... | | | | | | | 4.1 | 0 | 0 | 0 | | | 1.7 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | |
| Cylinder Shape | | | | | | | | | | | | | | | | | | | | | | | | | |
| I-head cyl.... | 18.4 | 12 | 14 | 5 | 10 | 17 | 3.7 | 0 | 0 | 0 | 18 | 3 | 9.2 | 3.0 | 8.0 | 6.0 | 15.0 | 17.0 | 14.6 | 13.0 | 13.0 | 15.0 | 27.0 | 17.0 | |
| T-head cyl.... | 1.6 | 3 | 5 | 7 | 11 | 13 | 10.9 | 34 | 21 | 15 | 12 | 10 | 23.4 | 34.0 | 45.0 | 44.0 | 28.0 | 26.0 | 29.2 | 37.0 | 41.0 | 42.0 | 34.0 | 53.0 | |
| L-head cyl.... | 82.0 | 82 | 69 | 74 | 73 | 70 | 84.2 | 66 | 75 | 78 | 70 | 87 | 60.0 | 62.0 | 47.0 | 50.0 | 57.0 | 57.0 | 47.8 | 42.0 | 36.0 | 34.0 | 38.0 | 26.0 | |
| Knight..... | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 | 0 | 0 | 0 | | | 7.4 | 1.0 | 0 | 0 | 0 | 0 | 8.4 | 8.0 | 8.0 | 0 | 0 | 0 | |
| How Cast | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block..... | 85.6 | 67 | 38 | 31 | 27 | 12 | 67.0 | 49 | 45 | 30 | 19 | 24 | 41.4 | 29.0 | 23.0 | 11.0 | 4.0 | 10.0 | 33.4 | 10.0 | 10.0 | 5.0 | 1.0 | 1.0 | |
| Separate..... | 7.2 | 13 | 31 | 37 | 40 | 52 | 4.0 | 6 | 15 | 24 | 21 | 58 | 1.3 | 3.0 | 11.0 | 15.0 | 29.0 | 32.0 | 4.7 | 14.0 | 12.0 | 18.0 | 20.0 | 25.0 | |
| Pairs..... | 7.2 | 20 | 31 | 32 | 33 | 36 | 25.0 | 42 | 38 | 45 | 60 | 18 | 32.0 | 39.0 | 46.0 | 68.0 | 67.0 | 58.0 | 22.4 | 58.0 | 71.0 | 74.0 | 79.0 | 74.0 | |
| Threes..... | 0 | 0 | 0 | 0 | 0 | 0 | 3.0 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18.0 | 7.0 | 3.0 | 0 | 0 | 0 | |
| Cooling | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pump..... | 25 | 16 | 29 | 39 | 24 | 30 | 85.5 | 86 | 74 | 66 | 49 | 50 | 88.5 | 91.0 | 89.0 | 97.0 | 94.0 | 70.0 | 91.5 | 98.0 | 96.0 | 94.0 | 95.0 | 94.0 | |
| Air..... | 0 | 8 | 19 | 13 | 15 | 4 | 0 | 0 | 2 | 2 | 3 | 42 | 0 | 2.0 | 2.0 | 2.0 | 3.0 | 5.0 | 1.9 | 0 | 3.0 | 3.0 | 4.0 | 4.0 | |
| Ther-o-syph.. | 75 | 76 | 52 | 48 | 61 | 66 | 14.5 | 14 | 24 | 31 | 48 | 42 | 14.5 | 7.0 | 9.0 | 1.0 | 3.0 | 25.0 | 9.6 | 2.0 | 1.0 | 3.0 | 1.0 | 2.0 | |
| Oiling | | | | | | | | | | | | | | | | | | | | | | | | | |
| Splash..... | 69 | 57 | 64 | 79 | 68 | 85 | 48.5 | | | | | | 35.7 | | | | | | | 19.5 | 27.0 | 32.0 | 62.0 | 74.0 | 85.0 |
| Splash-pres.. | 27.5 | 40 | 24 | 11 | 32 | 15 | 43.5 | | | | | | 47.4 | | | | | | | 43.5 | 37.0 | 38.0 | 0 | 0 | 0 |
| Pressure..... | 3.5 | 2 | 2 | 0 | 0 | 0 | 8.0 | | | | | | 16.9 | | | | | | | 37.0 | 36.0 | 30.0 | 38.0 | 26.0 | 15.0 |
| Ignition | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dual..... | 13.8 | 40 | 50 | 60 | 48 | 40 | 43.0 | 77 | 78 | 75 | 67 | 49 | 39.2 | 57.0 | 72.0 | 61.0 | 50.0 | 32.0 | 52.2 | 47.0 | 66.0 | 50.0 | 50.0 | 39.0 | |
| Single..... | 86.2 | 55 | 43 | 38 | 39 | 45 | 52.3 | 13 | 10 | 12 | 13 | 8 | 46.7 | 33.0 | 10.0 | 6.0 | 10.0 | 29.0 | 30.5 | 15.0 | 12.0 | 9.0 | 7.0 | 12.0 | |
| Double..... | 0 | 5 | 7 | 2 | 13 | 15 | 1.6 | 10 | 12 | 13 | 17 | 43 | 7.0 | 8.0 | 15.0 | 33.0 | 40.0 | 39.0 | 13.1 | 23.0 | 25.0 | 41.0 | 43.0 | 49.0 | |
| Two-point.... | 0 | | | | | | 0 | 0 | 0 | 0 | | | 1.8 | 2.0 | 3.0 | | | | 4.2 | 7.0 | 0 | 0 | 0 | 0 | |
| Duplex..... | 0 | | | | | | 3.1 | 0 | 0 | 0 | | | 5.3 | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | |
| Engine Starter Type | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acetylene.... | 0 | 3 | 19 | 20 | 0 | 0 | 0 | 0 | 18 | 9 | 0 | 0 | 0 | 0 | 7.0 | 10.0 | 0 | 0 | 0 | 0 | 16.1 | 10.0 | 0 | 0 | |
| Elec..... | 61 | 0 | 0 | 0 | 0 | 0 | 100 | 96 | 38 | 0 | 0 | 0 | 98.0 | 93.0 | 46.0 | 2.0 | 0 | 0 | 100 | 96.0 | 41.0 | 2.0 | 0 | 0 | |
| Optional..... | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 0 | 2.0 | 2.0 | 4.0 | 0 | 0 | 0 | 2.0 | 4.0 | 0 | 0 | 0 | |
| Mechanical.. | 3 | 9 | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 4.0 | 6.0 | 2.0 | 0 | 0 | 8.0 | 5.0 | 2.0 | 0 | |
| None..... | 10 | 70 | 75 | 100 | 100 | 100 | 0 | 0 | 31 | 85 | 99 | 0 | 0 | 0 | 23.0 | 80.0 | 97.0 | 99.0 | 0 | 0 | 20.0 | 80.0 | 95.0 | 98.0 | |
| Extra..... | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | 0 | | | | | | |

| CYLINDER SHAPES PERCENTAGE | | | | |
|----------------------------|--------|--------|--------|--------|
| | L-HEAD | T-HEAD | I-HEAD | KNIGHT |
| 1910 | 56% | 20% | 18% | 0 |
| 1911 | 60% | 22% | 14% | 1% |
| 1912 | 55% | 30% | 9% | 2% |
| 1913 | 56% | 31% | 9% | 3% |
| 1914 | 59% | 30% | 6% | 3% |
| 1915 | 70% | 16.5% | 8.5% | 3% |

The trend toward the L-head motor has been greatly accentuated for the 1915 season. The I-head is gaining slowly and the Knight holds its own

displacement of 349 cubic inches. This figure was reached after a steady rise from 1910 when the figure was 281.5. For 1915 it has dropped to 307.38, less than at any time since 1911. The efforts of designers toward securing better economy and more power from smaller motors are responsible in some degree for this reduction, but the addition of a large number of small cars which are of the class known as miniature automobiles has also been a deciding factor in reducing the displacement figures. In 1914 the cyclecar was a separate proposition and was not considered in averaging dimensions of the standard automobile. This season the cyclecar movement in greatly reduced form has been merged with the industry as a whole, taking the form of the miniature car.

The fact that the six continues to hold its own notwithstanding the large number of small fours, shows that the manufacturers struck a responsive chord in the purchaser when following the landslide toward the six-cylinder car which has grown steadily for 5 years. For 1915 47.5 per cent. of all our cars are sixes and 51 per cent. are fours. In 1914, 45 per cent. were sixes and 54 per cent. fours. The drop in fours has been in part accounted for by the practical elimination of the two-cylinder car and the introduction of the eight.

New entrants into the four-cylinder field are such concerns as Argo, Bauer, Briscoe, Dodge, F.R.P., Kearns, McIntyre, Remington and Sphinx. These with the exception of Dodge, Kearns, McIntyre and F.R.P. are in the small car class. In addition to these there are concerns who in 1914 made no fours but have re-entered the field for 1915. For example there are Inter-State and Peerless.

New Six Makers

To offset these additions and still have an increased percentage of sixes means that there must be several new names in the ranks of six-cylinder manufacturers. Examples of these are: Enger, Grant, Lexington, McIntyre, Monarch, Overland, Owen, Paige, Paterson, Pratt, Rayfield, Reo, Saxon and Singer. As a further aid to the cause of the six many former manufacturers of fours are now manufacturing other types. Examples of these are: Austin, Cadillac, Enger, Kline, Lexington, Monarch, Paige and Pathfinder. There are many others but these are typical examples. Such concerns as Enger and Paige have stopped making fours and are concentrating on sixes. Cadillac builds only eights.

A few have dropped out of the ranks of the six manufacturers. To give examples, there are Inter-State and Lyons.

Several concerns that manufactured fours a year ago are not manufacturing at present, these including Cameron, Fal, Lozier, Marathon, Marion, Staver, Tribune and Ohio. There are also several names appearing a year ago as makers of sixes, and who have since ceased manufacturing, these including American, Colby, Correja, Henderson, Howard, Keeton, Knox, Lozier, Marion and Palmer-Singer.

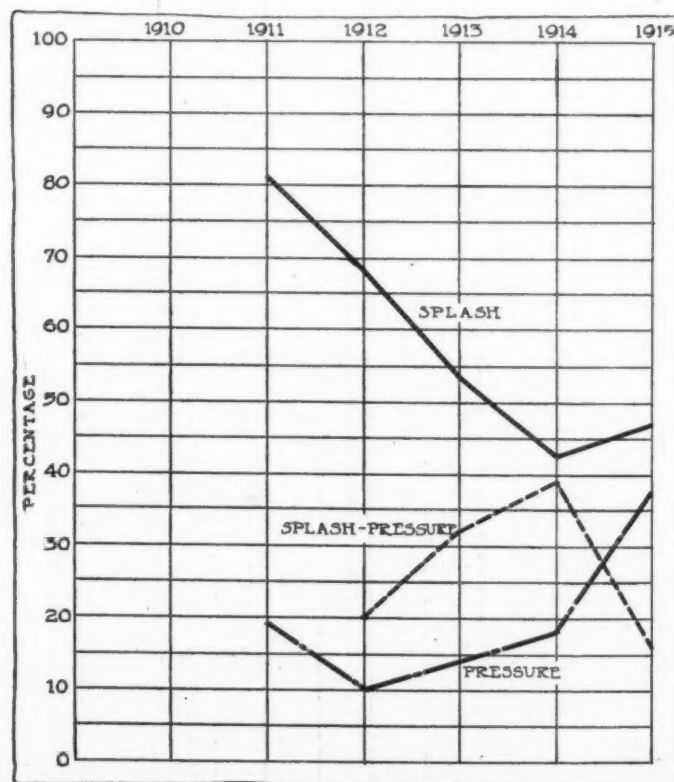
No prediction of an eight-cylinder American car was heard a year ago yet at this time at least three manufacturers,

Cadillac, King and Briggs, have cast their lot among those who believe in the double-four. With the necessity of arranging the cylinders differently in this class of motor the adoption of the larger number of cylinders has also marked the introduction of the V-type engine into the higher-priced cars. This, in turn, is the direct cause of other engineering developments which mark pioneer work for America. These are the yoke connecting-rod, and the other special designs necessary in arranging for the two blocks of four cylinders.

While helical gear drives for the camshaft still retain their supremacy the percentage of cars so fitted has dropped from 82 for 1914 to 76 for 1915. Spur gear drive on the other hand has risen from 10 per cent. in 1914 to 14 per cent. in 1915. Silent chain drive has risen from 8 to 10 per cent. The falling off in the helical gear percentage can be traced directly to the miniature cars. Concerns such as Argo, Cycleplane, Kearns, Peter Pan and Remington, who have brought out the new low-priced fours, do not use the helical gear, which is much more costly than the spur. Silent chain drive is used on the new Cadillac and King eights for accessory drives.

Stiffer Crankshafts Used

The shorter overall length of the block motor has resulted in a stiffer crankshaft but the higher speeds of the engine have increased the demands on the crankshaft to such an extent that manufacturers are still compelled to work towards an increased stiffness and strength. Larger diameters mean higher peripheral bearing speeds. The bearing is the shortest-lived part of the motor and to cut down its life still further is not desirable. To overcome this quandary manufacturers have been compelled to use the alloy-steel crankshaft and vanadium and chrome-nickel steel in this important part of the motor is not now uncommon. With the use of the alloy and a careful manipulation of the heat-treatment stiffness has not been sacrificed, while tensile strengths have gone up. It is not uncommon now to see crankshafts of 150,000 pounds per square inch tensile strength and yet with such



Both pressure and splash oiling systems are on the increase, but splash-pressure oiling is decreasing. The reason for the increase in pressure oiling lies in the use of the high-speed motor

an amount of stiffness that the critical speed of vibration is above the demands of ordinary use. General practice in the average motor still favors the .40 carbon open-hearth steel for crankshaft work.

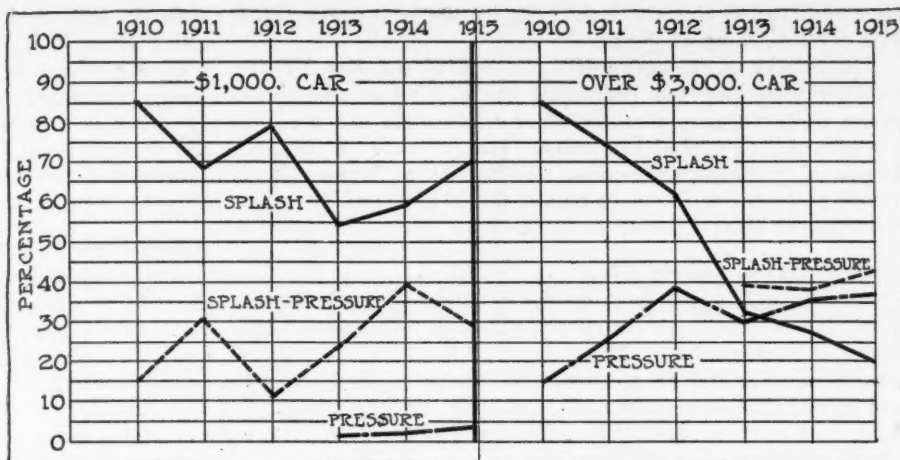
Connecting-rod practice has not changed materially. The use of alloy-steel has been common for the last 2 years, both chrome-vanadium and chrome-nickel playing an important part in the specifications. Many of the makers of lower-priced cars have found satisfactory results with .30-.40 carbon, acid, open-hearth steel, and as regards carbon content the choice seems to favor .25 per cent.

The use of tubular connecting-rods has been predicted by foreign engineers, but as yet no serious inroads on the ranks of the I-beam section have been made. The H-section connecting-rod holds its own in a small percentage of makes.

It is but natural that in the search for lighter parts a few tubular constructions should begin to make their appearance. Three of the Knight cars are equipped with tubular connecting-rods. These are Moline, Stearns and Lyons-Knight. In addition to these examples there is the new F. R. P.

Lightweight Pistons

Pistons are longer and lighter, which means thinner than in 1914. Weight has been saved in the thinning of the webbing. Neater core work, especially as regards the space surrounding the piston-pin boss has made a lighter job but perhaps the biggest saving in material and weight is in the piston rings. The practice of using fewer rings at the top



In every price class but that of cars selling for more than \$3,000 dual ignition is falling off. In that class there is a slight increase. Single ignition is rapidly increasing all along the line, the reason for this being the introduction of the electric cranking outfit

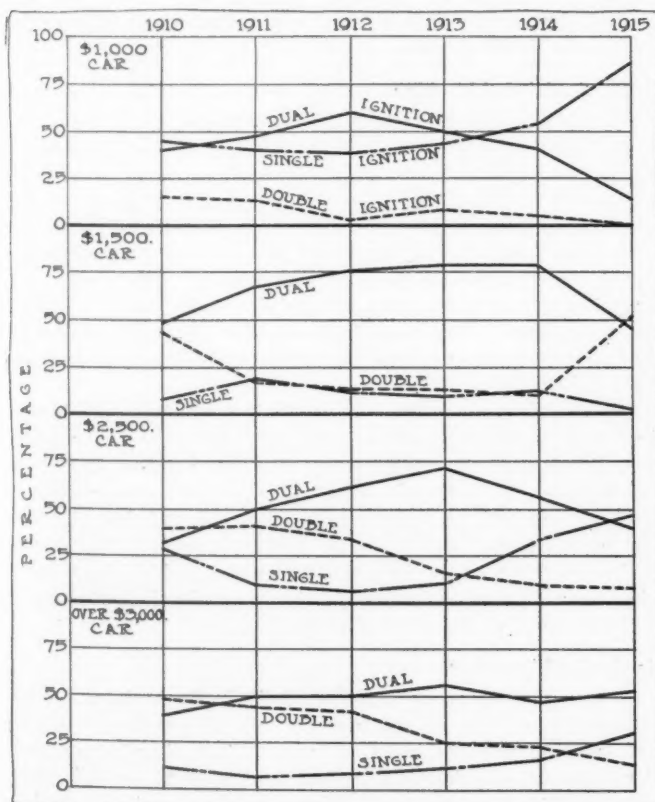
is growing rapidly. With the decrease in the number of rings, it is but natural that efforts would be made to make the rings themselves more efficient. The result is the growth of improved types of rings. The laminated or multiple design in which the ring is made up of several layers of metal is one instance of this. Another tendency in piston ring practice is to buy the product of specialists in piston-ring manufacture. These, as much as carbureters and magnetos, are designed with the special purpose in view of being the most efficient units for the functions that they must perform. The makers of these specialized products have secured patents on improvements of which the motor makers are beginning to be glad to avail themselves. They are proof against leakage and serve the same purpose as two or more of the ordinary rings without noticeably increasing the friction.

The rings used may be generally divided into two classes, the compound ring in which there are two or more complete separate rings of metal, and single rings. In the compound rings the increased surface and the staggered joints eliminate leaks and increase the life of the ring. In the single rings various lapping joints are used to insure continuity of the bearing surface and at the same time to prevent leakage.

Bearing Length Increased

Higher speeds mean reduced bearing life. When the designers increase the revolutions per minute of their motors it means an increase in bearing surface to make the life of the bearing remain the same. Increase in bearing surface has been gained by increasing the length of the bearings, although it is doubtful if diameters, on the whole, show any marked increase. Nineteen hundred and fourteen was the year of bigger crankshafts and when these reached their limit it was necessary to go into greater lengths. With the mounting of the cranking motor on the flywheel an increase of bearing length to take the side thrust of the cranking motor was required on the rear bearing. The result is an almost universal tendency towards longer rear main bearings.

In the exterior fittings of the motor greater accessibility exists throughout. The adoption of vacuum-gravity gasoline feed has enabled the carburetor to be mounted much higher than on gravity-fed cars. The raising of the carburetor is synonymous with the shortening of the intake manifold header, and in many instances the latter is eliminated altogether and the carburetor is bolted directly against the casting which contains the intake manifold as an integral part. When the carburetor bolts against the casting a vertical flange is most often used. This has led to the development of the horizontal type of carburetor. Overland, on the new six uses a short elbow to retain the vertical carburetor and on cars using the new high-speed Continental motor the car-



Splash and splash-pressure oiling are taking opposite trends in the \$1,000 car. Pressure oiling, which was introduced in this class in 1913, is slowly making itself felt. In the higher-priced car the splash-pressure system is supreme, but the pressure feed is rapidly gaining

bureter is bolted directly to the cylinder block on which there is a vertical, integral flange.

The raising of the carbureter has cleared the way for accessibly mounting the horizontal shaft driving the water pump, magneto, generator and other auxiliaries. It is a growing practice to extend the web at the juncture of the two halves of the crankcase making this horizontal flange a shelf to carry the entire auxiliary layout. This is one of the steps towards the clean exterior maintained on this year's motors.

Thermo-Syphon Cooling Gains

Thermo-syphon cooling continues to increase in percentage. For 1914 its chief advocates were among the lower-priced cars. It is now used on 27 per cent. of American chassis as compared to 19 per cent. Pump circulation is used on 72.5 per cent. This is a falling off of 6.5 per cent. as compared with 1914 and the reason can be assigned to the introduction of the miniature cars.

Air cooling has dropped from 2 per cent. to .5 per cent., now leaving Franklin as the only exponent of this method of cooling. In connection with this it is only fair to mention the successful demonstration made in the fall of this year by the Franklin motors, which, driven by representatives all over the country, successfully negotiated 100 miles on low gear without overheating.

Another big influence in the falling off of the air-cooled motor is the practical elimination of the cyclecar as a factor in the industry. Many of these cars had motorcycle motors with air cooling ribs. These have now disappeared and in their place are the small thermo-syphon cooled fours. The Duryea is an example of air-cooled car listed for 1914 but not included in the 1915 lists.

The arrangement of the valves has been greatly improved. The redistribution of the auxiliaries due to the higher mounting of carbureters, which in turn is a development due to the introduction of vacuum feed to a large extent, has allowed for the more accessible placing of valve adjustments. There can be no doubt that the intention to make exteriors simple and accessible has been a leading factor in development, and full advantage has been taken of the higher carbureter to place the valve adjustment parts in reach. Another valve development continued from 1914 and augmented this season is in the adoption of the tungsten steel valve. A score of representative makers are using these valves to eliminate the necessity for grinding. Many use them for the exhausts only and for the inlet employ nickel steel.

Bigger Waterjackets

Another point in which an improvement has been made in water circulation is in the employment of larger waterjackets by practically every manufacturer who has redesigned his motor for this season. The tendency, is to have a greater volume of water surrounding the cylinders and also to have this greater volume in constant circulation. We find, therefore, that water pumps are also more efficient or larger; and radiators of increased capacity. Hupmobile and Winton are good examples of those who have increased their radiator capacity.

There are three primary classes of motor lubrication. These are the splash, pressure, and a combination of the two which can be called splash-pressure.

In the splash system every bearing is lubricated by the splash from troughs or wells beneath the connecting-rods. The oil may be fed by pump, which is the generally-used method, or by gravity from a tank. The oil may be recirculated or simply fed as required to replace that used. It remains a splash system so long as every bearing surface of the motor, cylinders, pistons, crankshaft, camshaft, wristpins and timing gears are so lubricated.

In the pressure system, the oil is taken up from a reservoir by a pump and forced under pressure to the main bearings. At these points it enters the hollow crankshaft and flows

through this to the lower connecting-rod bearings. After oiling these it is forced through hollow leads to the wristpins and thence to the cylinder walls. There is no dipping of the connecting-rods into pools of oil but a certain amount of spray is always present. This is due to the oil thrown off by centrifugal force from the cranks. In a pressure-feed system the camshafts and the timing gears are generally oiled by independent leads.

Splash System Described

In the splash-pressure system the oil is carried under pressure to the main crankshaft bearings. The quantity pumped to these bearings under pressure is far in excess of that required to lubricate them. Consequently there is a continuous overflow which is utilized to fill the splash troughs or wells. The splash part of the system takes care of every bearing except the main bearings. There are many modifications of the splash-pressure system, some in which the camshaft bearings are fed by pump pressure direct, and others in which the oil under pressure is fed to the cylinder walls.

Motor lubrication, which was distinctive in 1914 on account of the increase in the number of those using pressure oiling, is like other features of the motor in enjoying an accentuated continued trend. Today 37.5 per cent. of our makes of cars are lubricated by pressure in which the oil is carried to the crankshaft bearings and thence by means of the hollow crankshaft to the lower connecting-rod bearings and finally through leads to the wristpins. The gain in pressure oiling is represented by the loss in splash-pressure systems. Splash oiling in which every bearing surface is taken care of by the lubricant splashed from troughs by the connecting-rods is also on the increase, having risen during the past season from 42 per cent. to 46.5 per cent. This is the first season in which no stock models are listed as feeding the lubricant with the fuel, since 1910. In 1913 and 1914, 1 per cent. of the manufacturers used this method and in 1910, 6 per cent. of our motors were so oiled. The elimination of the two-cycle motor is the reason.

Single Ignition Increases

The most striking trend in ignition is the adoption of the single system. There can be no doubt that if the magneto had not established itself as such an instrument of reliability, an even greater trend toward the single battery system would have been noted. As it is, single systems, whether by battery or magneto, have gained the ascendancy, having displaced the dual system from the leadership. The reason for the adoption of the single system is in the success of the electric starter. Most manufacturers feel that it is no longer necessary to have one source of current for starting and another for running.

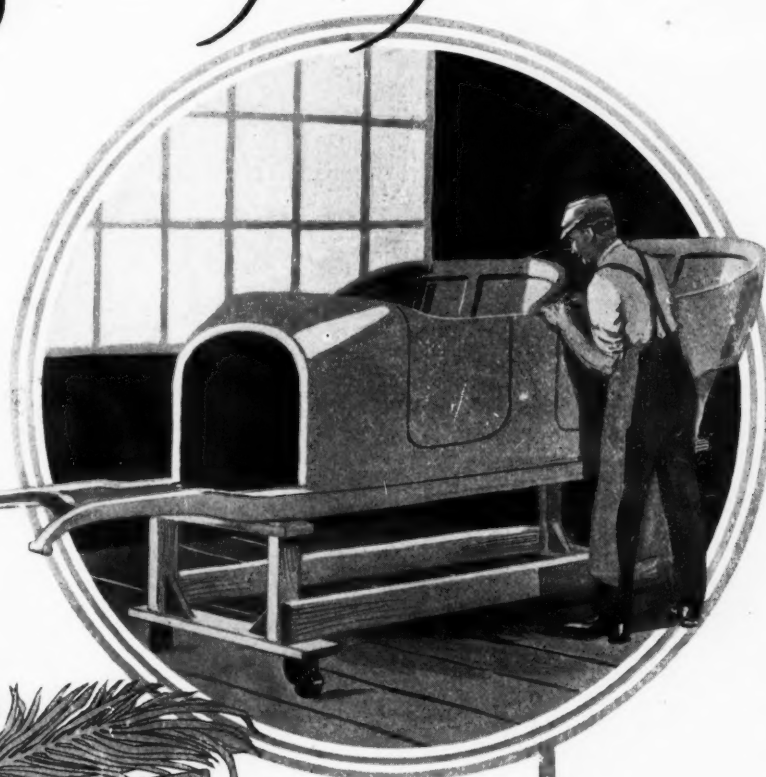
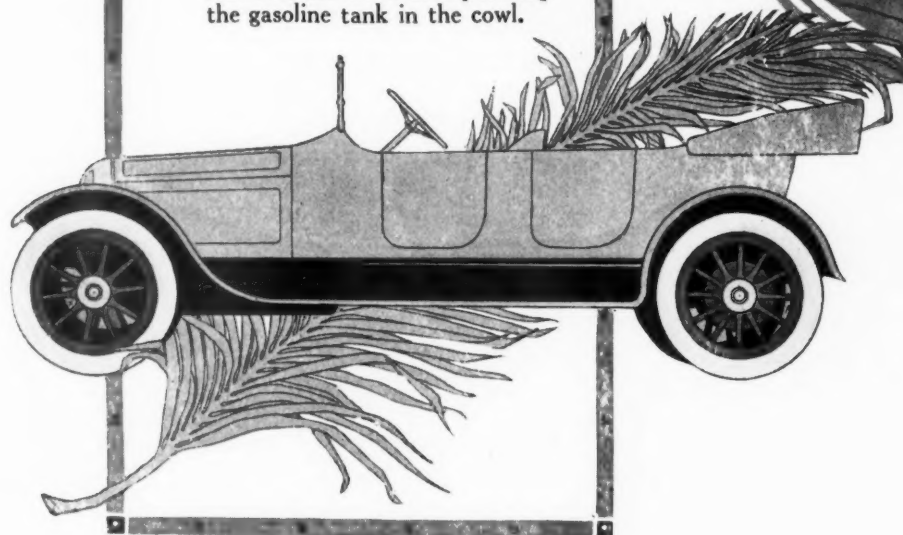
Where the single magneto system is used, it is considered that the cranking motor can turn the engine over so rapidly that starting on the magneto is as readily accomplished as starting on the battery. Where the single battery system has been adopted, it is because there is no need for two current generating outfits. The generator supplies the current to the battery and the battery to the remainder of the electrical instruments including the ignition distributor as well as the lamps and the cranking motor.

Single Ignition Gains

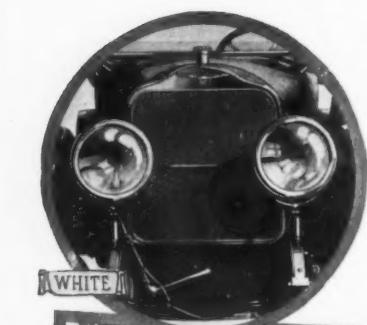
In the percentage column we find single ignition on 56 per cent. In 1914 it was used on but 23 per cent. While dual ignition was in the majority in 1914, having 50 per cent. of all the installations, it is now relegated to second place with but 36 per cent. Double ignition also continues to fall off. Last season 11 per cent. were so equipped. This year but 4.5 per cent. use it. Two-spark ignition is used on 1.4 per cent. this season as compared to 4 per cent. last, and duplex 2 per cent. for 1915 against 3 per cent. for 1914. The differences are absorbed in the gain in single ignition.

Car Bodies of 1915

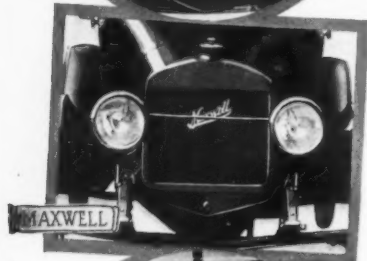
FOLLOWING its custom of previous years The Automobile presents in the following pages its Car Illustrated Department showing the leading makes of open touring cars, runabouts and combination types for 1915. Grouping the makes side by side permits the reader to study the individual types and also to compare designs as well as enabling him to generalize on leading trends. An analysis of the groups shows a perceptible lowering of many designs and a greater effort to link the hood and body lines into one by a cowl that plays the part of a uniting member, not a few incorporating the gasoline tank in the cowl.



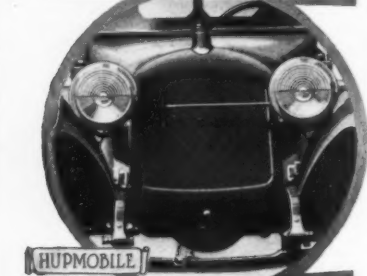
Touring Cars



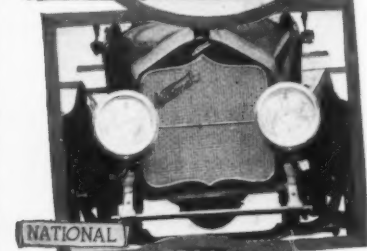
WHITE



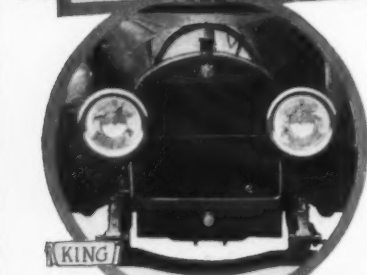
MAXWELL



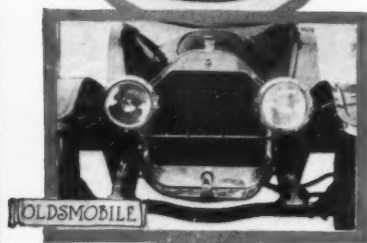
HUPMOBILE



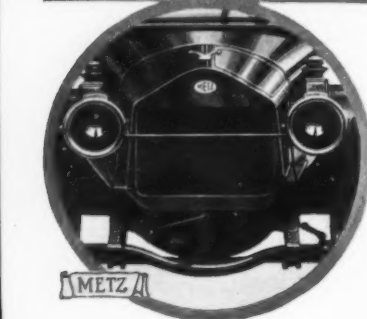
NATIONAL



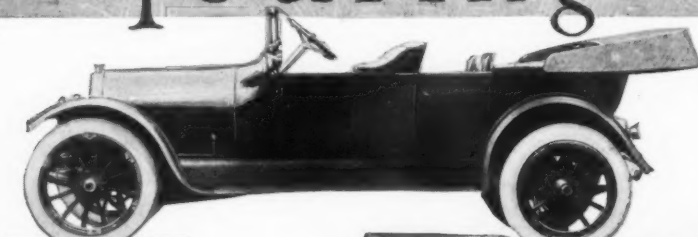
KING



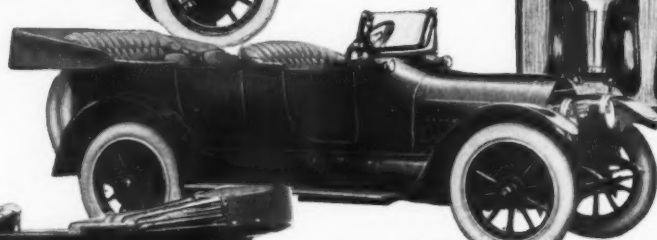
OLDSMOBILE



METZ

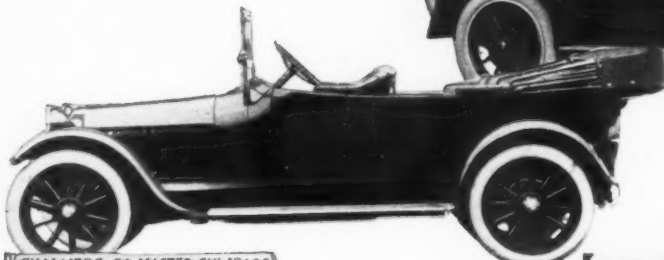


OVERLAND SIX \$1475



LOCOMOBILE

CADILLAC

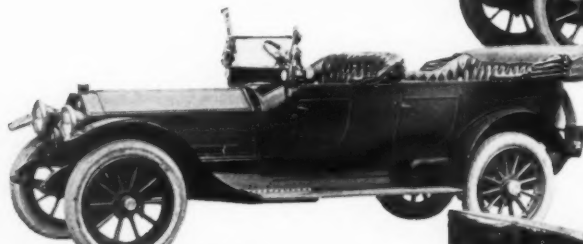


CHALMERS 29 MASTER SIX \$2400

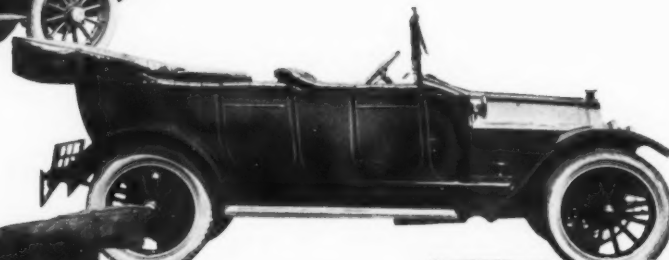
CADILLAC EIGHT \$1975



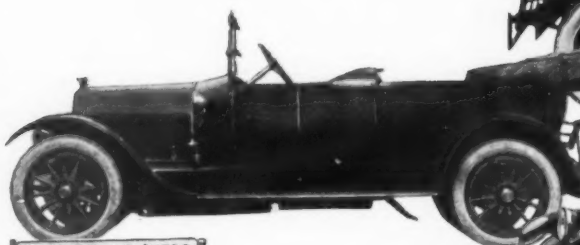
PACKARD 3-38 \$3850



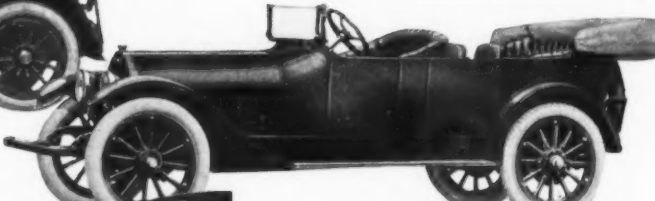
PEERLESS 48-SIX \$5000



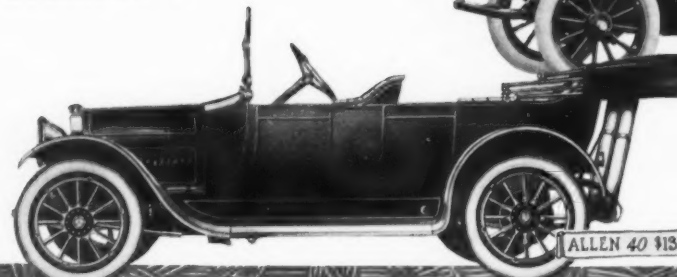
LYONS-KNIGHT K-4 \$2980



SIMPLEX A-2 \$5700



PRATT 6-50 \$2250



ALLEN 40 \$1395

Overland, 82, \$1,475, Six, 3 1/4 x 5 1/4, 125 W.B., 35 x 4 1/2-inch tires.

Chalmers Master, Six, \$2,400, Six, 3 1/4 x 5 1/4, 125 1/2 W.B., 34 x 4 1/2-inch tires.

Peerless, 48-Six, 4 1/4 x 6, 137 W.B., 37 x 5-inch tires.

Simplex, A-2-38 H.P., \$5,700, Four, 4 1/4 x 6 1/4, 137 W.B., 35 x 5-inch tires.

Allen, 40, \$1,395, Four, 4 1/4 x 5, 118 W.B., 35 x 4 1/2-inch tires.

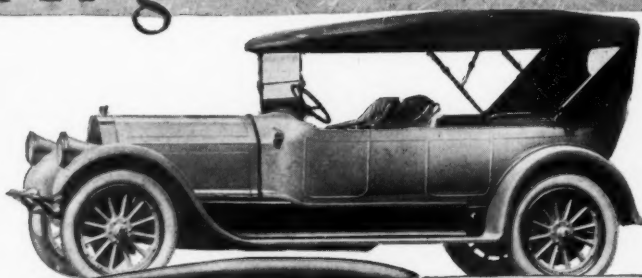
Cadillac, Eight, \$1,975, Eight, 3 1/4 x 5 1/4, 122 W.B., 36 x 4 1/2-inch tires.

Packard, 3-38, \$3,850, Six, 4 x 5 1/4, 140 W.B., 37 x 5-inch tires.

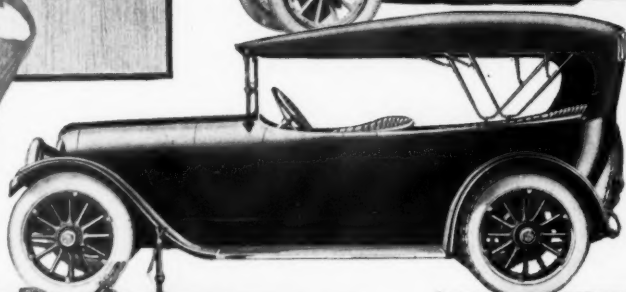
Lyons-Knight, K-4, \$2,980, Four, 4 1/4 x 5 1/4, 130 W.B., 37 x 5-inch tires.

Pratt, 6-50, \$2,250, Six, 3 3/4 x 5 1/4, 132 W.B., 37 x 4 1/2-inch tires.

Seating Seven



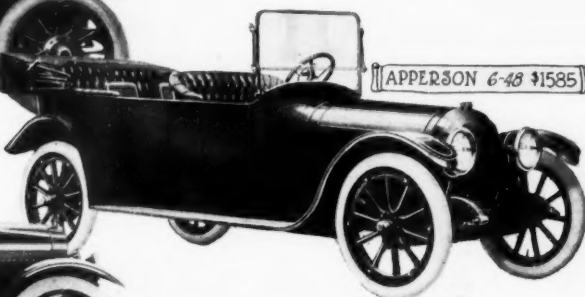
PIERCE-ARROW 66-A-3 \$6000



PAIGE SIX 46 \$1395



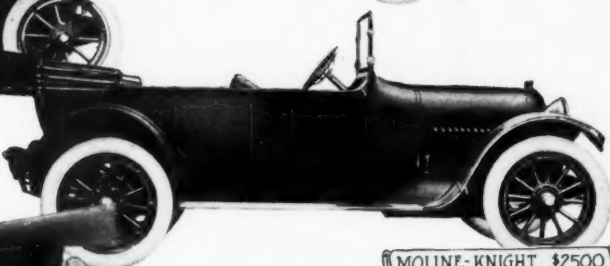
OAKLAND 6-49 \$1685



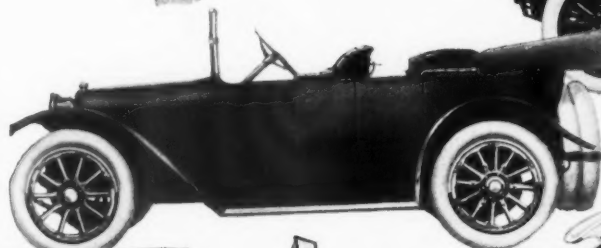
APPERSON 6-48 \$1585



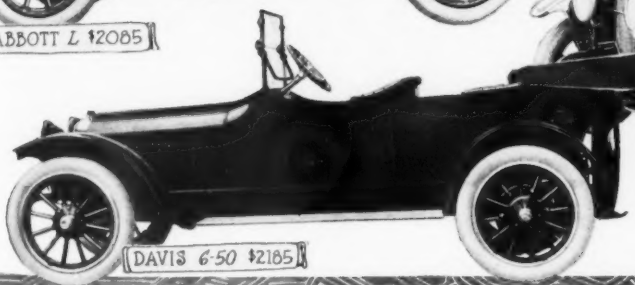
WHITE 45 \$3800



MOLINE-KNIGHT \$2500



ABBOTT L \$2085



DAVIS 6-50 \$2165

ENGER 6-50 \$1495

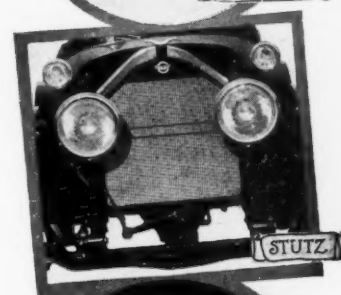
Oakland, 6-49, \$1,685, Six, 3 1/2 x 5, 123 1/4 W.B., 35 x 4 1/2-inch tires.
 White, 45, \$3,800, Four, 4 1/4 x 6, 132 1/4 W.B., 34 x 4-inch tires.
 Abbott L, \$2,085, Four, 4 1/4 x 5 1/2, 121 W.B., 36 x 4 1/4-inch tires.
 Davis, Six-50, \$2,185, Six, 3 3/4 x 5 1/4, 128 W.B., 37 x 4 1/2-inch tires.

Pierce-Arrow, 66-A-3, \$6,000, Six, 5 x 7, 147 1/4 W.B., 38 x 5 1/2-inch tires.

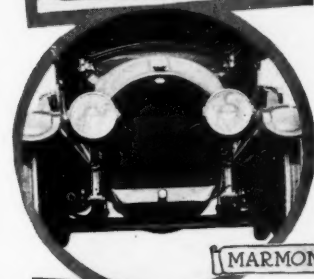
Paige, Six-46, \$1,395, Six, 3 1/2 x 5 1/4, 124 W.B., 34 x 4-inch tires.
 Apperson, 6-48, \$1,585, Six, 3 1/2 x 5 1/4, 126 W.B., 34 x 4-inch tires.
 Moline-Knight, \$2,500, Four, 4 x 6, 128 W.B., 36 x 4 1/2-inch tires.
 Enger, 6-50, \$1,495, Six, 3 1/2 x 5, 125 W.B., 34 x 4-inch tires.



OVERLAND



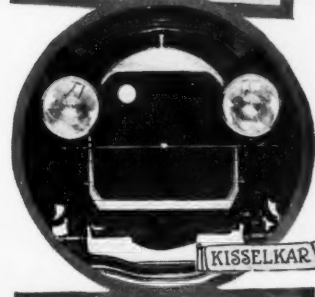
STUTZ



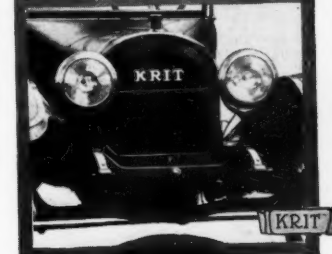
MARMON



STEARNS



KISSELKAR

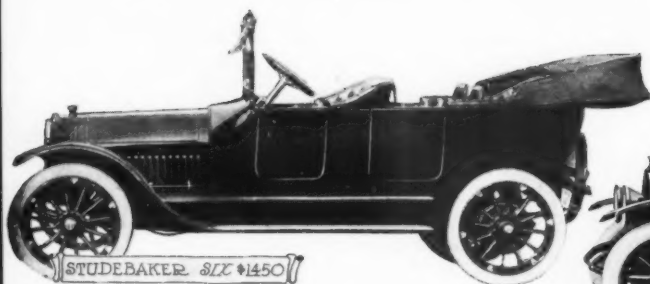


KRIT

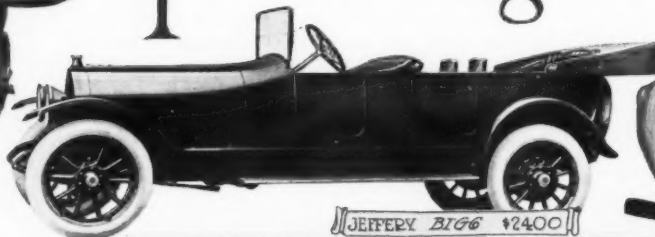


GLIDE

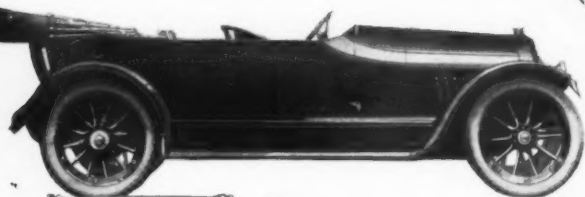
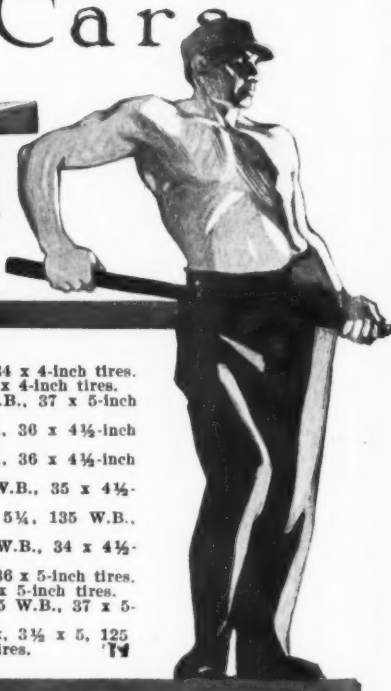
Touring Cars



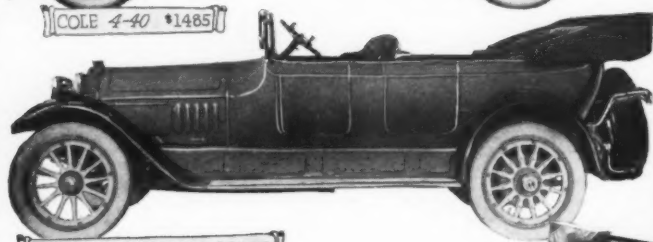
STUDEBAKER SIX \$1450



JEFFERY BIG SIX \$2400



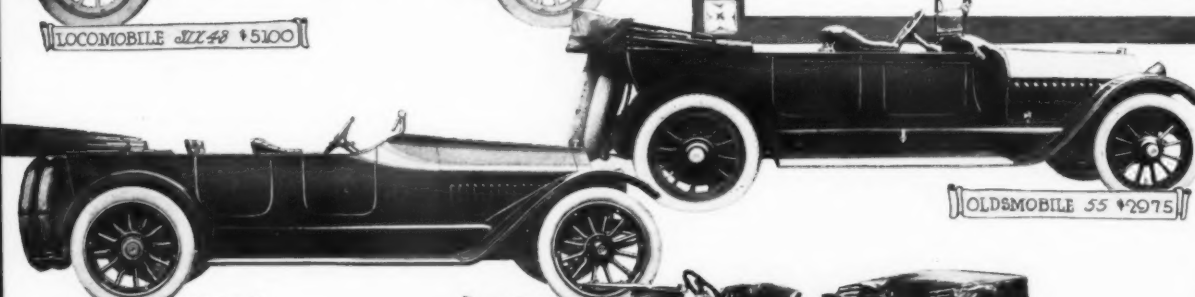
COLE 4-40 \$1485



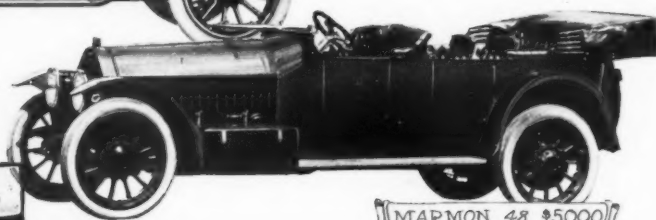
LOCOMOBILE SIX \$5100

Studebaker, Six, \$1,450, Six, $3\frac{1}{2} \times 5$, 121 W.B., 34 x 4-inch tires.
 Cole, 440, \$1,485, Four, $4\frac{1}{4} \times 5\frac{1}{4}$, 118 W.B., 34 x 4-inch tires.
 Locomobile, 6-48, \$5,100, Six, $4\frac{1}{2} \times 5\frac{1}{2}$, 140 W.B., 37 x 5-inch tires.
 National, A A, \$2,500, Six, $3\frac{3}{4} \times 5\frac{1}{2}$, 132 W.B., 36 x $4\frac{1}{2}$ -inch tires.
 Imperial, 6-56, \$2,200, Six, $3\frac{3}{4} \times 5\frac{1}{2}$, 130 W.B., 36 x $4\frac{1}{2}$ -inch tires.
 Klinekar, 6-42 A, \$1,850, Six, $3\frac{1}{2} \times 5\frac{1}{4}$, 127 W.B., 35 x $4\frac{1}{2}$ -inch tires.
 Pathfinder, Leather Stocking, \$2,750, Six, $4\frac{1}{4} \times 5\frac{1}{4}$, 135 W.B., 35 x 5-inch tires.
 Jeffery, Big Six, \$2,400, Six, $3\frac{3}{4} \times 5\frac{1}{4}$, 133 $\frac{1}{2}$ W.B., 34 x $4\frac{1}{2}$ -inch tires.
 Oldsmobile, 55, \$2,975, Six, $4\frac{1}{4} \times 5\frac{1}{4}$, 139 W.B., 36 x 5-inch tires.
 Marmon, 48, \$5,000, Six, $4\frac{1}{2} \times 6$, 145 W.B., 37 x 5-inch tires.
 Speedwell Rotary Six, \$2,590, Six, $4\frac{1}{4} \times 5\frac{1}{4}$, 135 W.B., 37 x 5-inch tires.

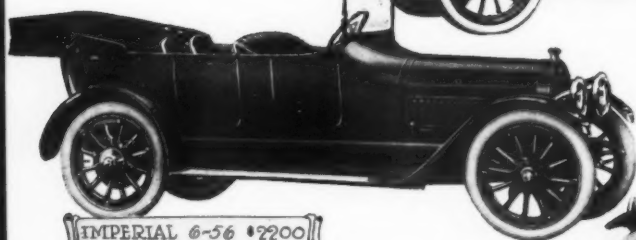
Monarch, \$1,250, Six, $3\frac{3}{4} \times 5$, 125 W.B., 33 x 4-inch tires.



NATIONAL AA \$2500



MARMON 48 \$5000



IMPERIAL 6-56 \$2200



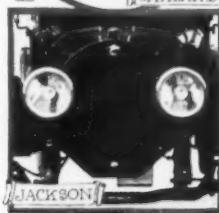
KLINE KAR. 6-42A \$1850



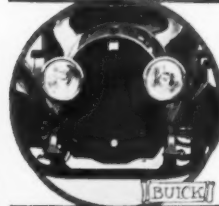
SPEEDWELL ROTARY SIX \$2590



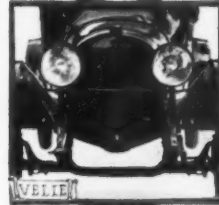
OAKLAND



JACKSON



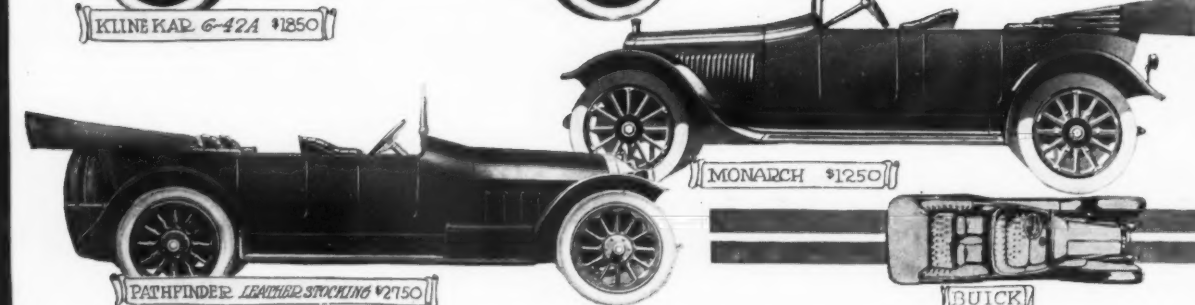
BUICK



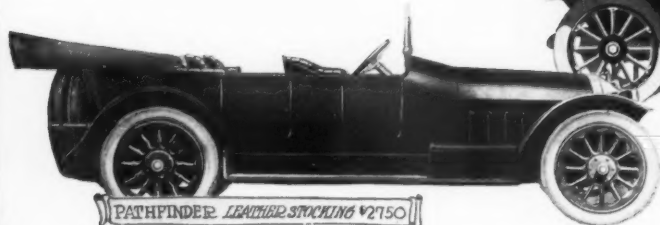
VELIE



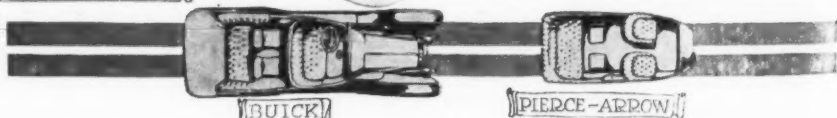
REGAL



MONARCH \$1250



PATHFINDER LEATHER STOCKING \$2750

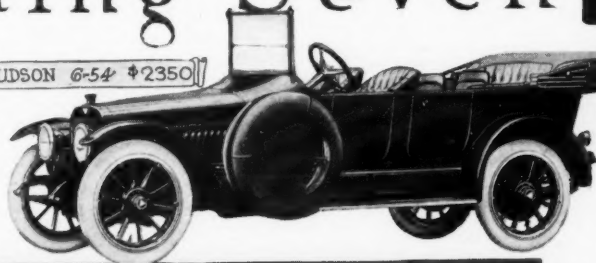


BUICK

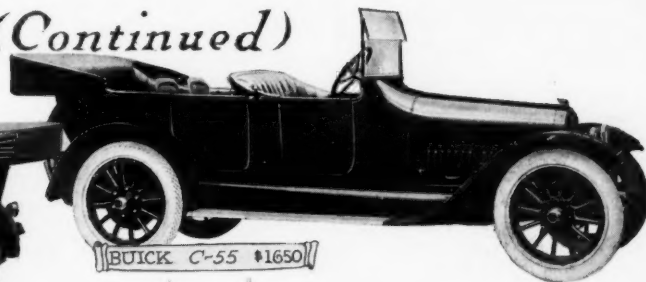
PIERCE-ARROW

Seating Seven (Continued)

HUDSON 6-54 \$2350



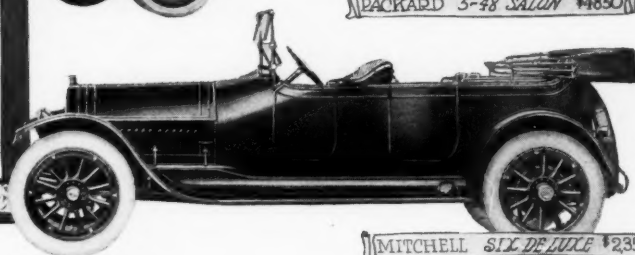
BUICK C-55 \$1650



Hudson, 6-54, \$2,350, Six, 4 1/4 x 5 1/4, 135 W.B., 36 x 4 1/2-inch tires.
 Stevens-Duryea, DD 6, \$4,800, Six, 4 7/16 x 5 1/2, 138 W.B., 37 x 5-inch tires.
 Cunningham, Touring, \$3,750, Four, 4 1/4 x 5 1/4, 129 W.B., 37 x 5-inch tires.
 Republic, E., \$2,950, Six, 4 1/4 x 5, 133 W.B., 36 x 4 1/2 tires.
 Paterson, 6-48, \$1,495, Six, 3 1/2 x 5, 124 W.B., 34 x 4 tires.
 Buick, C-55, \$1,650, Six, 3 1/2 x 5, 130 W.B., 36 x 4 1/2 tires.
 Packard, 5-48, Salon Touring, \$4,850, Six, 4 1/2 x 5 1/2, 144 W.B., 37 x 5-inch tires.
 Mitchell, Six DeLuxe, \$2,350, Six, 4 1/4 x 7, 144 W.B., 37 x 5-inch tires.
 Fiat, 6-50, \$5,150, Six, 4 1/4 x 5 1/2, 135 W.B., 37 x 5 tires.
 Chadwick, 19, \$5,500, Six, 5 x 6, 133 W.B., 37 x 5 tires.
 Touraine, Touring, \$3,250, Six, 4 x 5 1/2, 134 W.B., 34 x 4 1/2-inch tires.
 Pilot, Light Six, \$1,885, Six, 3 1/2 x 5 1/2, 125 W.B., 34 x 4-inch tires.



PACKARD 5-48 SALON \$4850



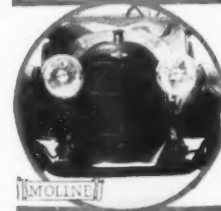
MITCHELL SIX DE LUXE \$2350



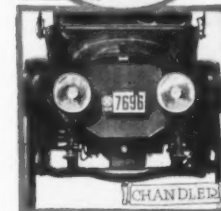
CADILLAC



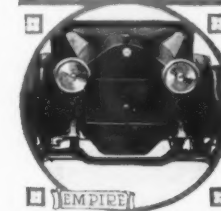
WINTON



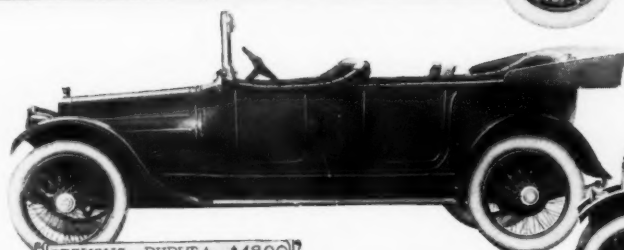
MOLINE



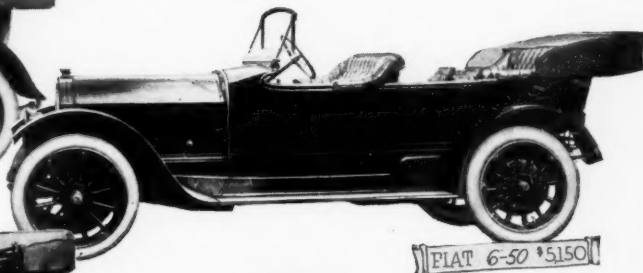
CHANDLER



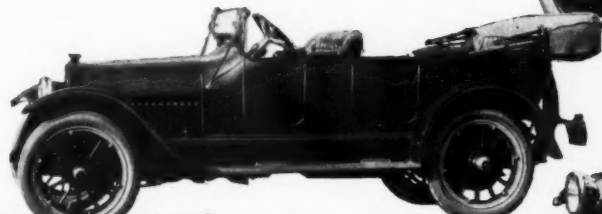
EMPIRE



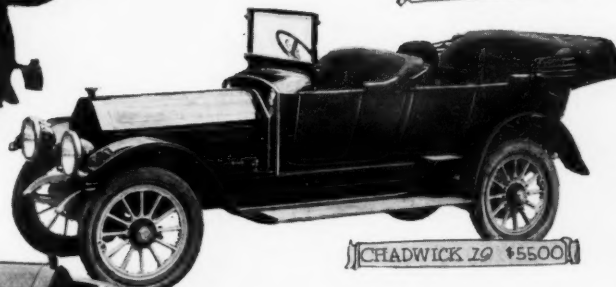
STEVENS-DURYEA \$4800



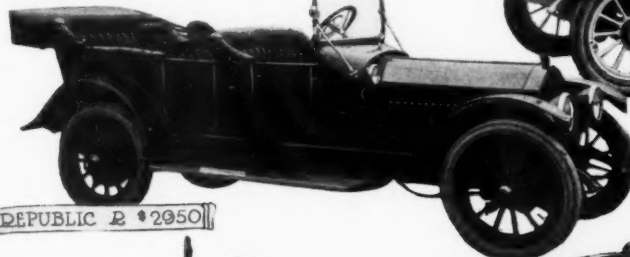
FIAT 6-50 \$5150



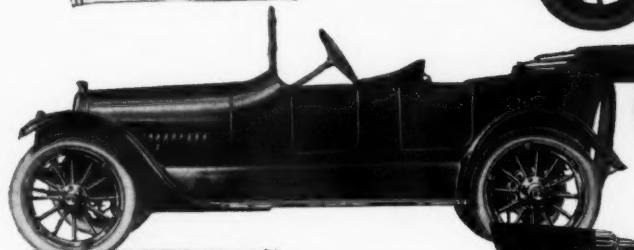
CUNNINGHAM \$3750



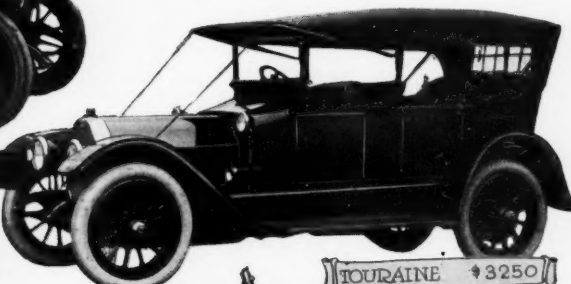
CHADWICK 19 \$5500



REPUBLIC R \$2950



PATERSON 6-48 \$1495



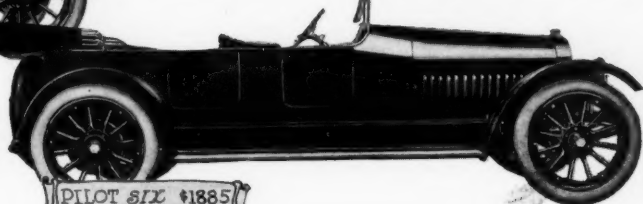
TOURAINÉ \$3250



COLE



PATHFINDER



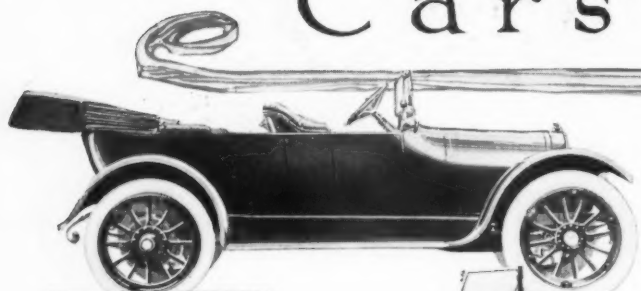
PILOT SIX \$1885

Cars Carrying

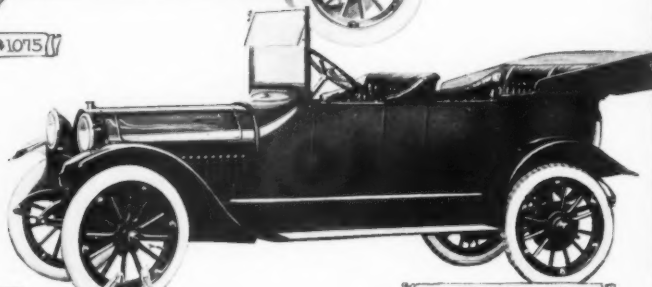
Five-Passenger Cars

This list of five-passenger cars is greater this year than ever before, this body size being the popular one in all prices of cars. There is a slight growth in popularity of four-passenger types, especially where narrow style of body is desired

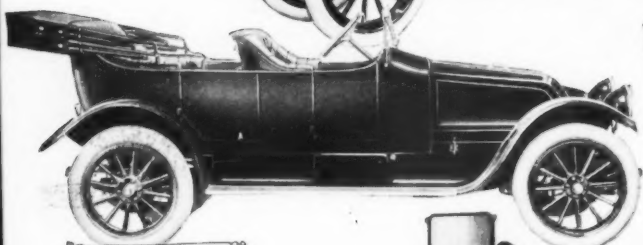
Overland, 80, \$1,075, Four, 4 1/2 x 4 1/2, 114 W.B., 34 x 4-inch tires.
 Studebaker Six, \$1,385, Six, 3 1/2 x 5, 121 W.B., 34 x 4-inch tires.
 Franklin, \$2,150, Six, 3 1/2 x 4, 120 W.B., 34 x 4 1/2-inch tires.
 Kisselkar, 42-Six, Two-door, \$1,650, Six, 3 1/2 x 5 1/2, 126 W.B., 35 x 4 1/2 tires.
 Regal, D, \$1,085, Four, 3 1/2 x 5, 112 W.B., 32 x 3 1/2-inch tires.
 Stearns-Knight, Light Four, \$1,750 3 1/2 x 5 1/2, 119 W.B., 34 x 4-inch tires.
 Pullman, Junior, \$740, Four, 3 1/2 x 4 1/2, 110 W.B., 30 x 3 1/2-inch tires.
 Sphinx, \$695, Four, 3 1/2 x 5, 112 W.B., 30 x 3 1/2-inch tires.
 Pathfinder, Daniel Boone, \$2,222, Six, 3 1/2 x 5 1/2, 125 W.B., 34 x 4 1/2 tires.
 Cartecar, O, \$1,250, Four, 3 1/2 x 5, 106 W.B., 33 x 4-inch tires.
 Empire, 31-40, \$975, Four, 3 1/2 x 4 1/2, 108 W.B., 32 x 3 1/2-inch tires.
 Paterson, 4-32, \$1,095, Four, 3 1/2 x 5, 112 W.B., 33 x 4-inch tires.



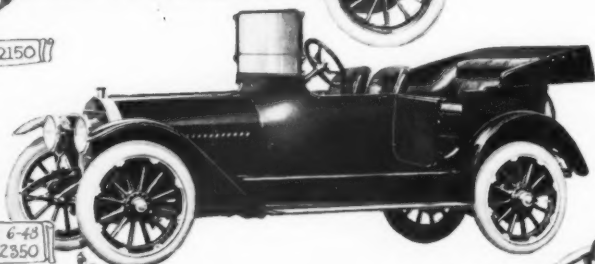
OVERLAND 80 \$1075



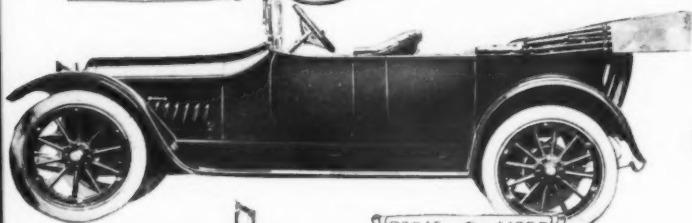
STUDEBAKER SIX \$1385



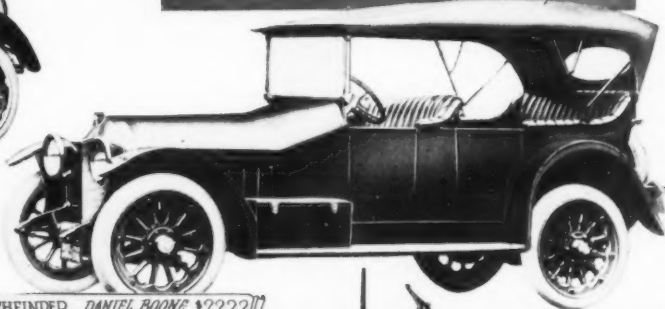
FRANKLIN \$2150



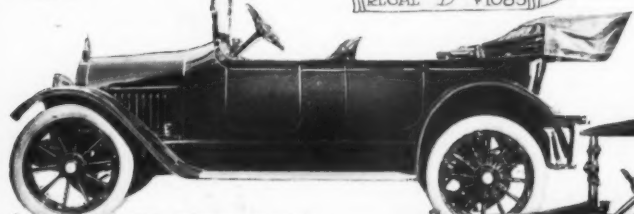
KISSELKAR 42-SIX TWO-DOOR \$2350



REGAL D \$1085



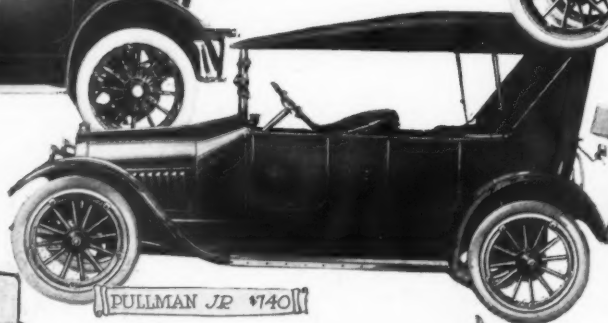
PATHFINDER DANIEL BOONE \$2222



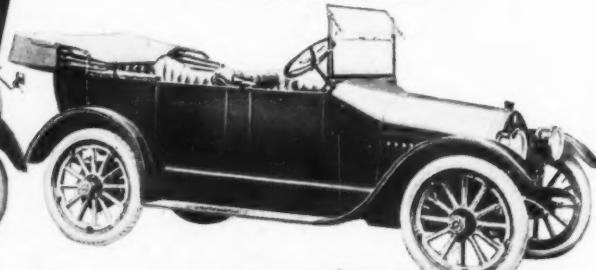
STEARNS-KNIGHT FOUR \$1750



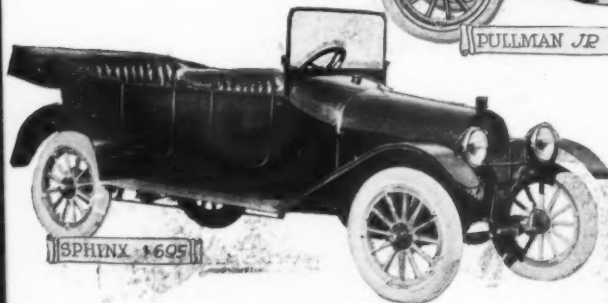
CARTECAR O \$1250



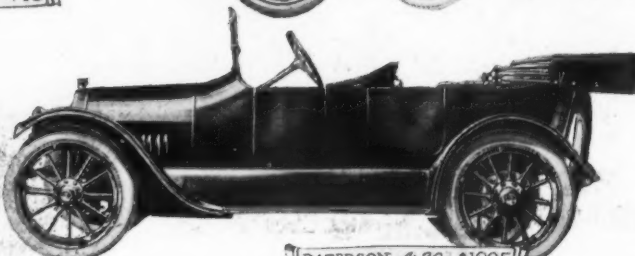
PULLMAN JR \$740



EMPIRE 31-40 \$975




SPHINX \$695



PATERSON 4-32 \$1095

Five Passengers



BUICK C-25 \$950

CADILLAC EIGHT TYPE 51 \$1975

PIERCE-ARROW 38 C-3 \$4300

PEERLESS ALL PURPOSE FOUR \$2000

JEFFREY CHESTERFIELD SIX \$1650

OLDSMOBILE 42 \$1285

JACKSON OLYMPIC 46 \$1375

CRAWFORD 6-35 \$1850

DODGE \$785

PULLMAN 6-48 \$2350

APPERSON 4-40 \$1350

McFARLAN 75 \$2590

Buick, C-25, \$950, Four, 3 3/4 x 3 3/4, 106 W.B., 32 x 3 1/2-inch tires.

Peerless, All-Purpose, \$2,000, Four, 3 3/4 x 5, 113 W.B., 34 x 4-inch tires.

Oldsmobile, 42, \$1,285, Four, 3 3/4 x 5, 112 W.B., 33 x 4-inch tires.

Crawford, 6-35, \$1,850, Six, 3 3/4 x 5, 120 W.B., 34 x 4-inch tires.

Dodge, \$785, Four, 3 3/4 x 4 1/2, 110 W.B., 32 x 3 1/2-inch tires.

Apperson, 4-40, \$1,350, Four, 4 x 5, 116 W.B., 34 x 4-inch tires.

Cadillac, Type 51, \$1,975, Eight, 3 3/4 x 5 1/2, 122 W.B., 36 x 4 1/2-inch tires.

Pierce-Arrow, 38-C-3, \$4,300, Six, 4 x 5 1/2, 134 W.B., 36 x 4 1/2-inch tires.

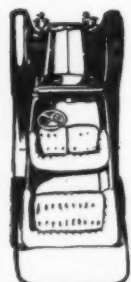
Jeffrey, Chesterfield, \$1,650, Six, 3 x 5, 122 W.B., 34 x 4-inch tires.

Jackson, Olympic 46, \$1,375, Four, 4 1/4 x 5 1/4, 117 W.B., 34 x 4-inch tires.

Pullman, 6-48, \$2,350, Six, 3 3/4 x 5 1/4, 134 W.B., 36 x 4 1/2-inch tires.

McFarlan, 75, \$2,590, with Six, 4 x 6, 132 W.B., 36 x 4 1/2-inch tires, \$2,000, with Six, 4 1/4 x 6, 132 W.B., 36 x 4 1/2-inch tires.

Cars Carrying Five



MAXWELL



FRANKLIN



K.R.T.



HAYNES

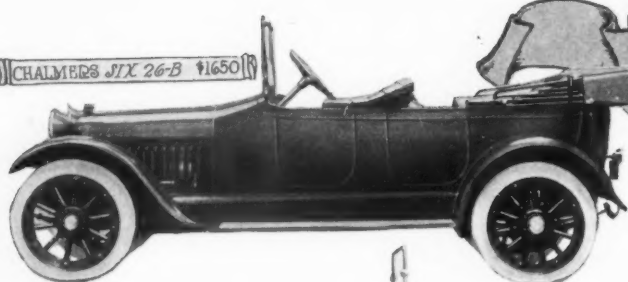


MERCER

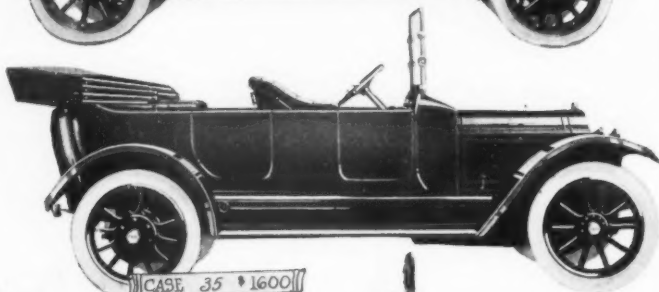


KING

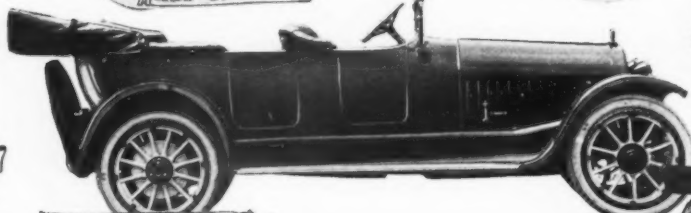
CHALMERS SIX 26-B \$1650



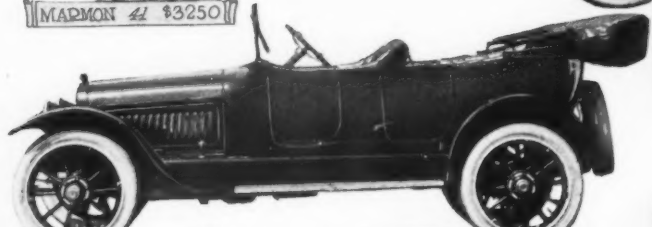
CASE 35 \$1600



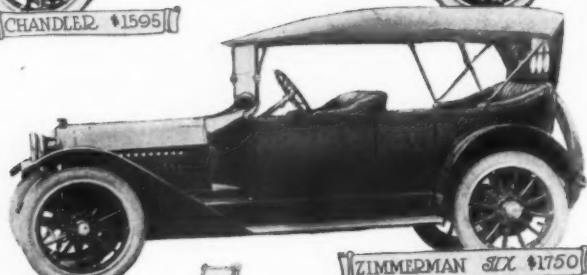
MARMON 41 \$3250



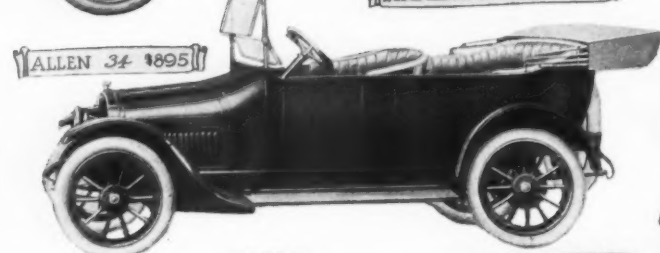
CHANDLER \$1595



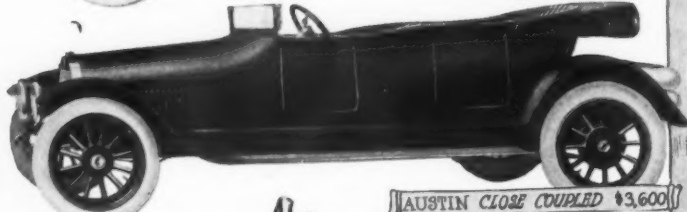
ZIMMERMAN SIX \$1750



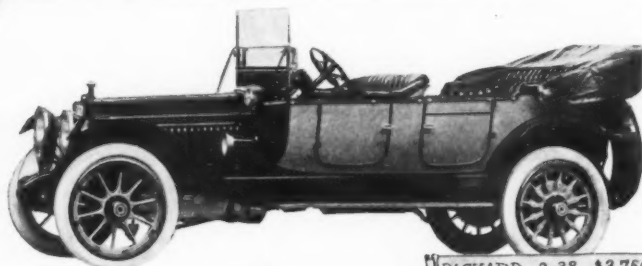
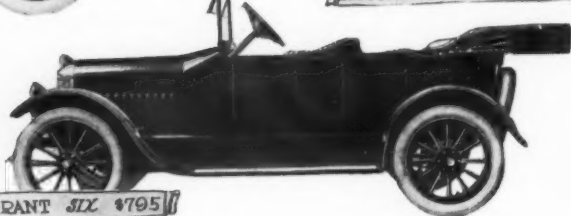
ALLEN 34 \$895



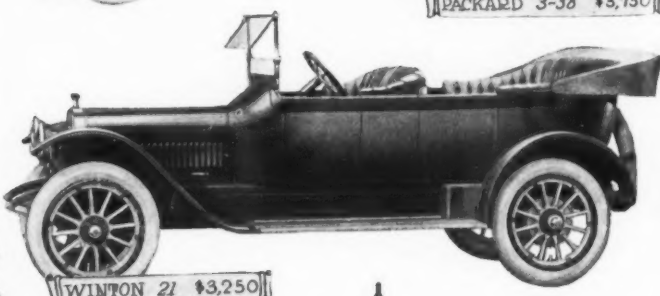
AUSTIN CLOSE COUPLED \$3,600



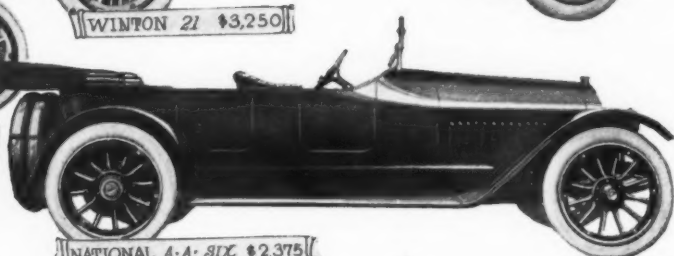
GRANT SIX \$795



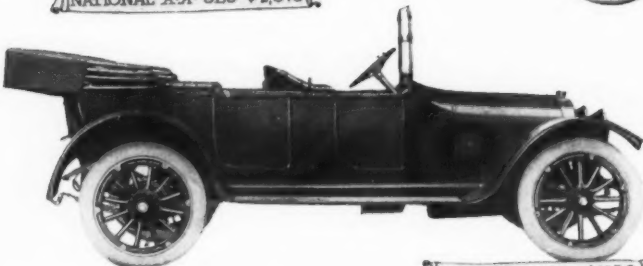
PACKARD 3-38 \$3,750



WINTON 21 \$3,250



NATIONAL A.A. SIX \$2,375



WESTCOTT 30 \$1,150

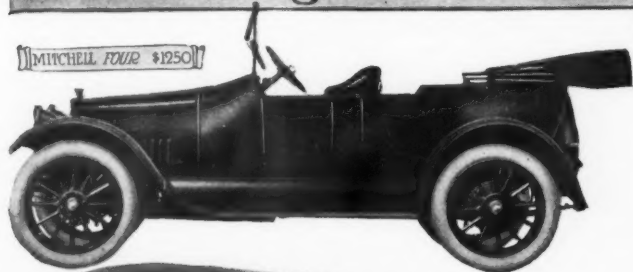


IMPERIAL 64 \$1,085

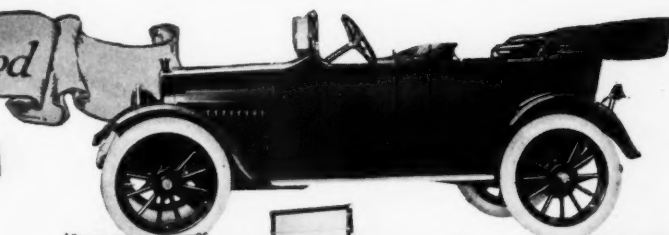
Chalmers, 26 B, \$1,650, Six, 3 1/2 x 5 1/2, 125 1/2 W.B., 34 x 4 1/2-inch tires.
 Case, 35, \$1,600, Four, 4 1/4 x 5 1/2, 120 W.B., 35 x 4 1/2-inch tires.
 Marmon, 41, \$3,250, Six, 4 1/4 x 5 1/2, 132 1/2 W.B., 36 x 4 1/2-inch tires.
 Chandler, \$1,595, Six, 3 3/4 x 5, 120 W.B., 34 x 4-inch tires.
 Zimmerman, Six, \$1,750.
 Allen, 34, \$895, Four, 3 3/4 x 5, 110 W.B., 32 x 3 3/4-inch tires.
 Austin, Close-Coupled, \$3,600, Six, 4 1/4 x 6, 141 W.B., 34 x 4 1/2-inch tires.
 Grant, Six, \$795, Six, 2 3/4 x 4 1/4, 100 W.B., 30 x 3 3/4-inch tires.
 Packard, 3-38, \$3,750, Six, 4 x 5 1/2, 140 W.B., 37 x 5-inch tires.
 Winton, 21, \$3,250, Six, 4 1/2 x 5 1/2, 136 W.B., 37 x 5-inch tires.
 Westcott, 30, \$1,150, Four, 3 1/2 x 5, 113 W.B., 33 x 4-inch tires.
 National, A. A., \$2,375, Six, 3 3/4 x 5 1/2, 132 W.B., 36 x 4 1/2-inch tires.
 Imperial, 64, \$1,085, Four, 3 3/4 x 5, 111 W.B., 32 x 3 3/4-inch tires.

Passengers Continued

MITCHELL FOUR \$1250



KRIT O \$850

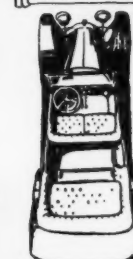
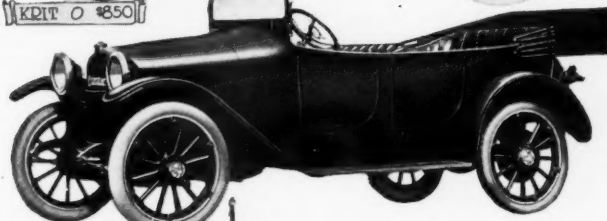


HUPMOBILE

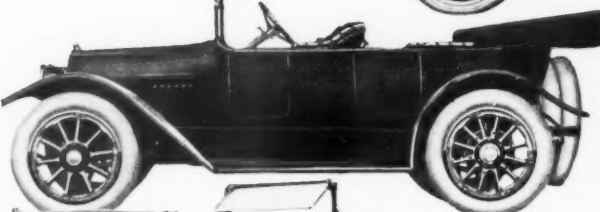
VELIE 15 \$1595



DETROITER C \$1050

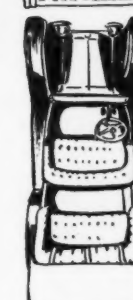
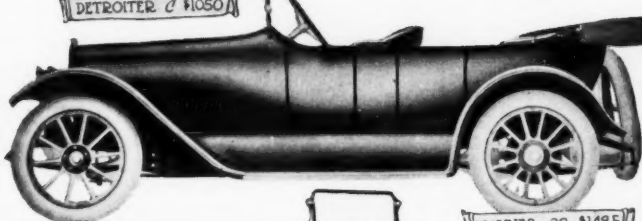


MITCHELL



ABBOTT K \$1785

HAYNES 30 \$1485

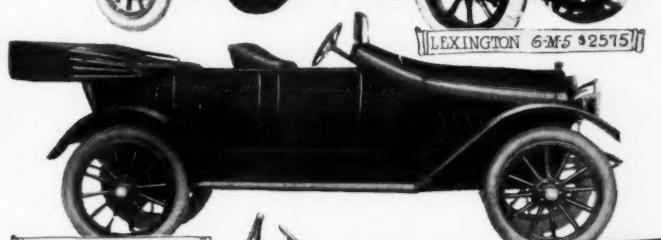


CARTER CAR

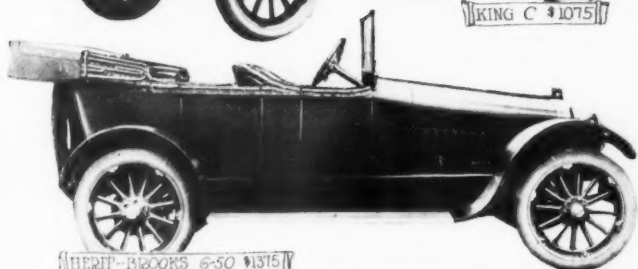


KING C \$1075

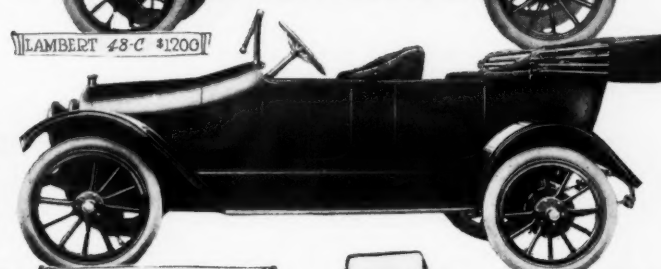
LEXINGTON 6-M-5 \$2575



NATIONAL



HERFF-BROOKS 6-50 \$1315

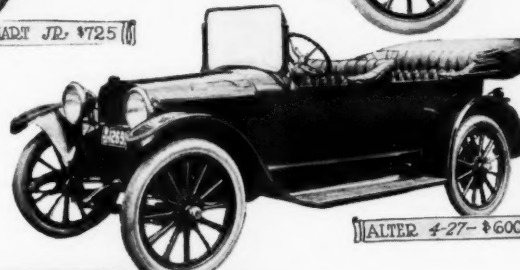


LAMBERT 48-C \$1200



APPERSON

CROW-ELKHART JR. \$725



ALTER 4-27-\$600

Mitchell, Light Four, \$1,250, Four, 4 x 5 1/2, 116 W.B., 34 x 4-inch tires.
 Velie, 15, \$1,595, Six, 3 1/2 x 5, 124 W.B., 34 x 4-inch tires.
 Abbott, K, \$1,785, Four, 4 1/4 x 5 1/4, 116 W.B., 34 x 4-inch tires.
 King, C, \$1,075, Four, 3 15/16 x 5, 113 W.B., 33 x 4-inch tires. Starter extra.
 Herff-Brooks, 6-50, \$1,375, Six, 4 x 4 1/4, 124 W.B., 34 x 4-inch tires.
 Krit, O, \$850, Four, 3 3/4 x 4, 108 W.B., 32 x 3 1/2-inch tires.
 Detrioter, C, \$1,050, Four, 3 1/2 x 5, 112 W.B., 32 x 3 1/2-inch tires.
 Haynes, 30, \$1,485, Six, 3 1/2 x 5, 121 W.B., 34 x 4-inch tires.
 Lexington, 6-M-5, \$2,575, Six, 4 1/4 x 5, 130 W.B., 36 x 4 1/2-inch tires.
 Lambert, 48-C, \$1,200, Four, 3 3/4 x 4, 112 W.B., 32 x 3 1/2-inch tires.
 Crow-Elkhart, Jr., \$725, 3 1/2 x 4 1/2, 104, 30 x 3 1/2.
 Alter, 4-27, \$600, with starter \$685, Four, 3 3/4 x 4 1/4, 106 W.B., 30 x 3 1/2-inch tires.
 Dorris, I A, \$2,200, Four, 4 1/4 x 5, 121 W.B., 36 x 4 1/2-inch tires.

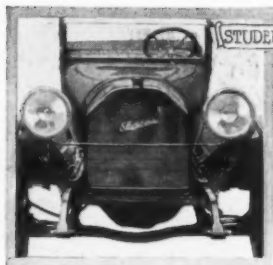


DORRIS I A \$2200



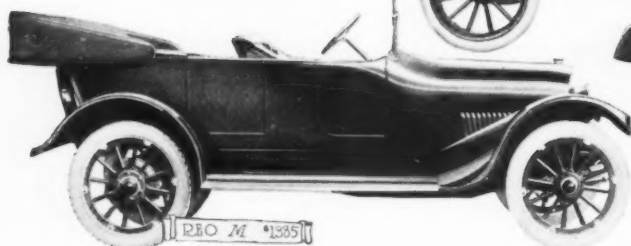
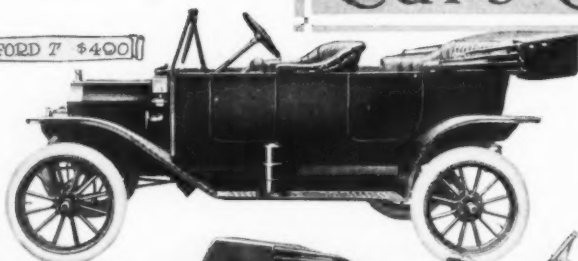
EMPIRE

Cars Carrying Five



STUDEBAKER

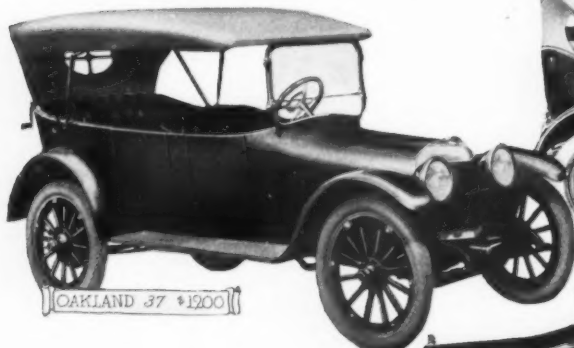
FORD T \$400



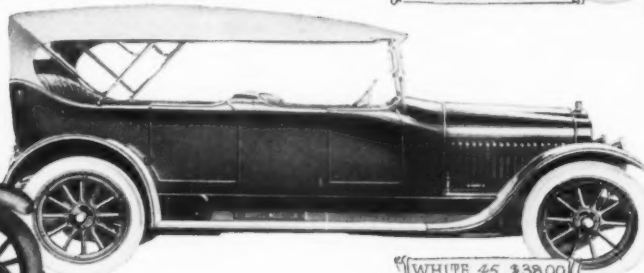
REO M \$1385



OVERLAND 82 \$850



OAKLAND 37 \$1200



WHITE 45 \$3800



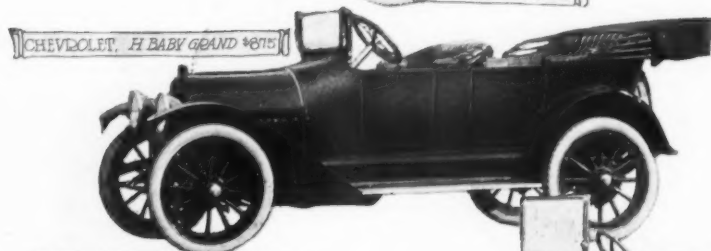
CASE 25 \$1350



KLINEKAR 6-42 \$1750



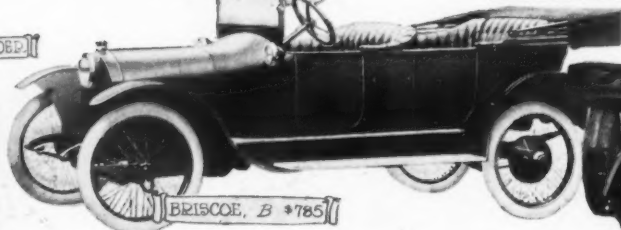
SINGER \$2350



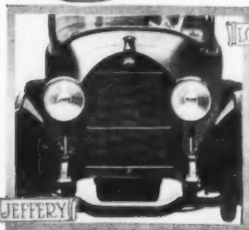
CHEVROLET, H BABY GRAND \$875



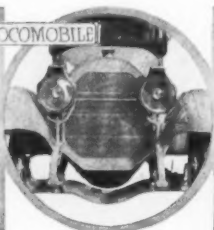
PATHFINDER



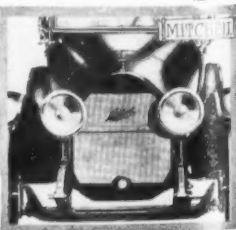
BRISCOE, B \$785



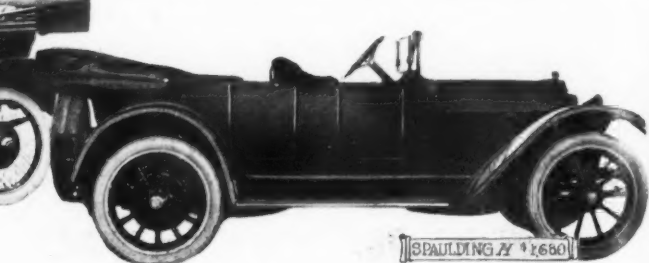
JEFFERY



LOCOMOBILE



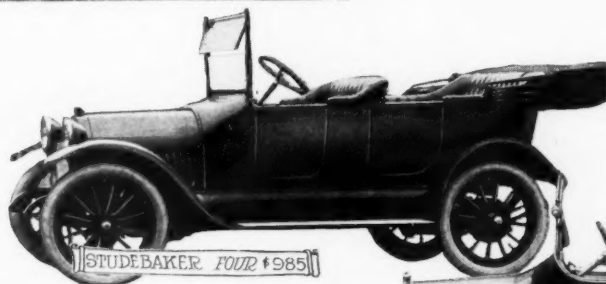
MITCHELL



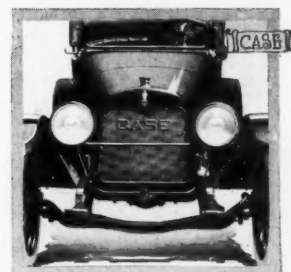
SPaulding H \$1680

Reo, M, \$1,385, Six, 3 9/16 x 5 1/4, 122 W.B., 34 x 4-inch tires.
 Oakland, 37, \$1,200, Four, 3 1/2 x 5, 112 W.B., 33 x 4-inch tires.
 Klinekar, 6-42, \$1,750, Six, 3 1/2 x 5 1/4, 123 W.B., 34 x 4-inch tires.
 Case, 25, \$1,350, Four, 3 3/4 x 4 1/4, 115 1/2 W.B., 34 x 4-inch tires.
 Singer, \$2,350, Six, 4 x 5 1/2, 135 W.B., 36 x 4 1/2-inch tires.
 Chevrolet, H, Baby Grand, \$875, Four, 3 11/16 x 4, 106 W.B., 32 x 3 1/2-inch tires.
 Briscoe, B, \$785, Four, 3 1/4 x 5 1/4, 107 W.B., 30 x 3 1/2-inch tires.
 Ford, T, \$490, Four, 3 3/4 x 4, 100 W.B., 30 x 3 1/2-inch tires.
 Overland, 81, \$850, Four, 4 x 4 1/4, 106 W.B., 33 x 4-inch tires.
 White, 45-Touring, \$3,800, Four, 4 1/4 x 6 3/4, 132 1/2 W.B., 34 x 4 1/2-inch tires.
 Spaulding, H, \$1,680, Four, 4 1/4 x 5 1/2, 120 W.B., 36 x 4-inch tires.

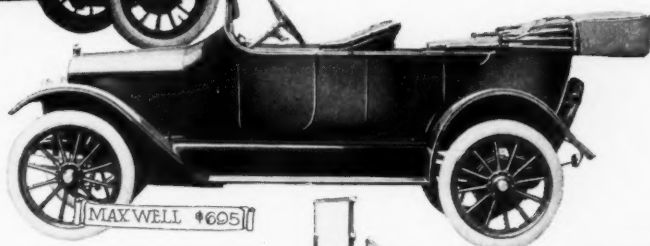
Passengers Continued



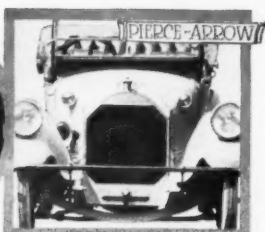
STUDEBAKER FOUR \$985



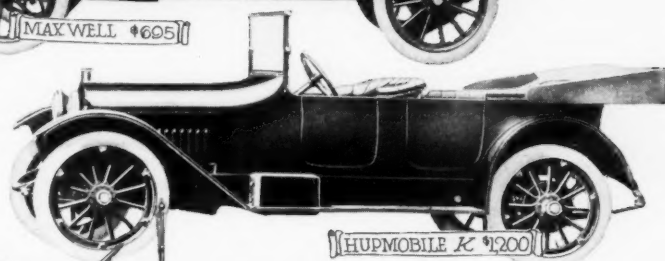
CASE



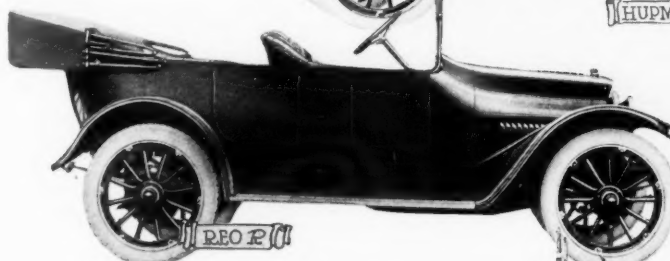
MAXWELL \$695



PIERCE-ARROW



HUPMOBILE K \$1200



REO R



MOON 4-38 \$1350

Glide, 30, \$1,195, Four, 3½ x 5, 114 W.B., 32 x 4-inch tires.

R. C. H., \$900, Four, 3½ x 5, 110 W.B., 32 x 3½-inch tires.

Studebaker, Four, \$985, Four, 3½ x 5, 108 W.B., 33 x 4-inch tires.

Maxwell, Touring, \$695, Four, 3½ x 4½, 102 W.B., 30 x 3½-inch tires. Starter extra.

Hupmobile, K, \$1,200, Four, 3½ x 5½, 119 W.B., 34 x 4-inch tires.

Reo, R, \$1,050, Four, 4¼ x 4½, 115 W.B., 34 x 4-inch tires.

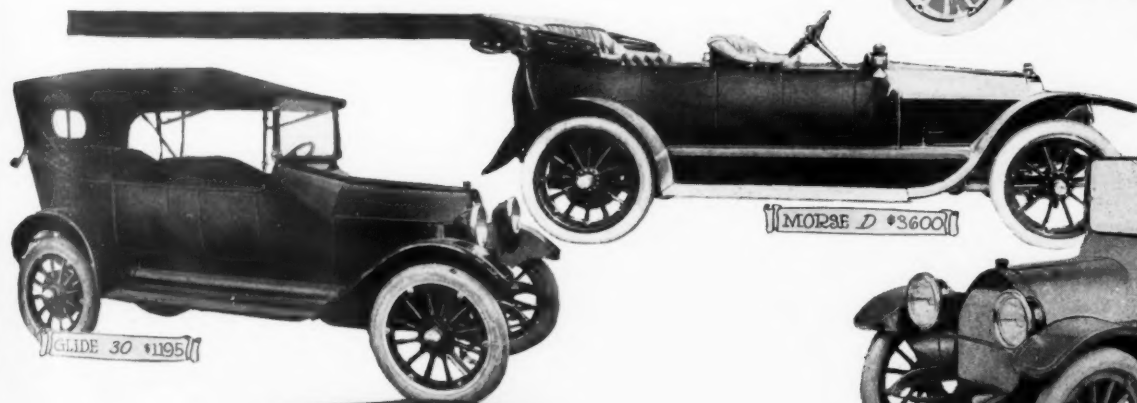
Moon, 4-38, \$1,350, Four, 3½ x 5, 122 W.B., 34 x 4-inch tires.

Morse, D, \$3,600, Four, 4¼ x 5, 127 W.B., 36 x 4½-inch tires.

Auburn, 4-36, \$1,075, Four, 3½ x 5, 114 W.B., 32 x 4-inch tires.

Saxon, Six, \$785, Six, 2½ x 4½, 112 W.B., 32 x 3½-inch tires.

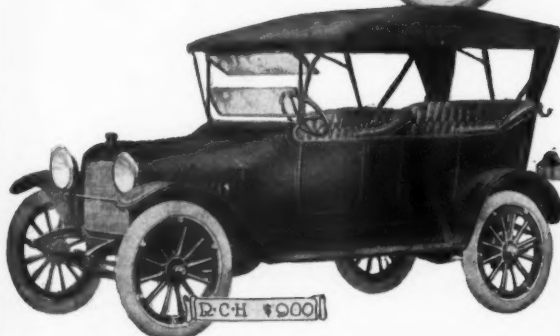
In addition to these, the following cars are made in five-passenger form but are not illustrated as such: Arlenz, Bauer, Chadwick, Corbitt, Davis, Enger, Flat, Firestone, Great Western, Inter-State, Locomobile, Lyons-Knight, Meteor, Moline, Monarch, Paige, Pratt, Republic, Stevens-Duryea, Touraine.



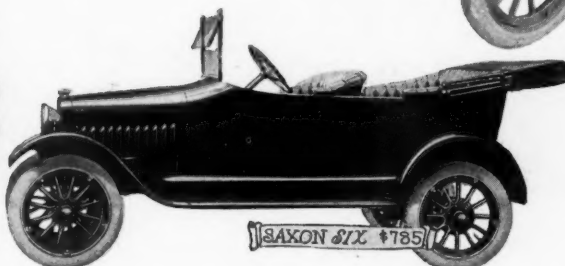
MORSE D \$3600



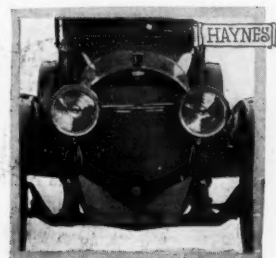
AUBURN 4-36 \$1075



R.C.H. \$900

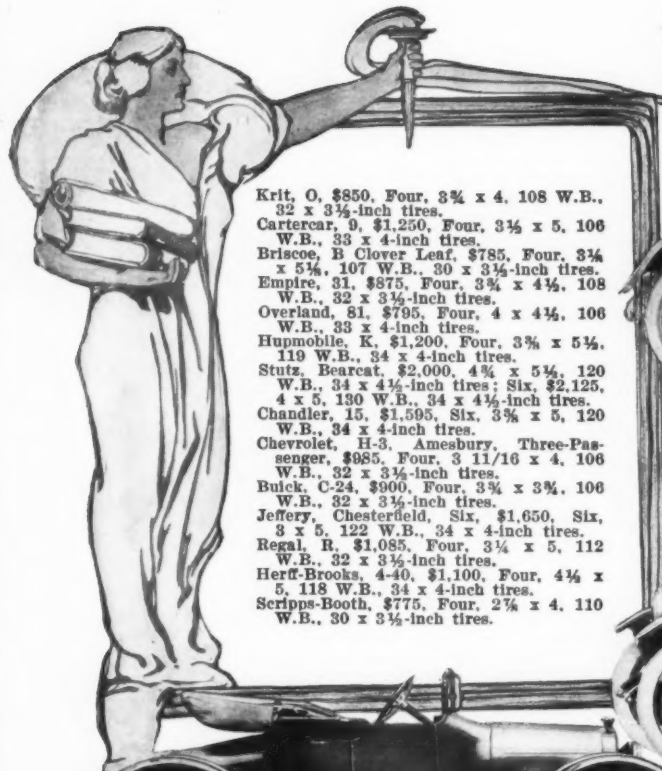


SAXON SIX \$785



HAYNES

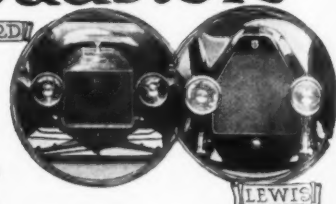
Runabouts, Roadsters



Krit, O. \$850. Four, 3 1/4 x 4. 108 W.B., 32 x 3 1/2-inch tires.
 Cartercar, 9. \$1,250. Four, 3 1/4 x 5. 106 W.B., 33 x 4-inch tires.
 Briscoe, B Clover Leaf, \$785. Four, 3 1/4 x 5 1/4. 107 W.B., 30 x 3 1/2-inch tires.
 Empire, 31. \$875. Four, 3 1/4 x 4 1/4. 108 W.B., 32 x 3 1/2-inch tires.
 Overland, 81. \$795. Four, 4 x 4 1/4. 106 W.B., 33 x 4-inch tires.
 Hupmobile, K. \$1,200. Four, 3 3/4 x 5 1/4. 119 W.B., 34 x 4-inch tires.
 Stutz, Bearcat, \$2,000. 4 1/2 x 5 1/4. 120 W.B., 34 x 4 1/2-inch tires; Six, \$2,125, 4 x 5. 130 W.B., 34 x 4 1/2-inch tires.
 Chandler, 15. \$1,595. Six, 3 3/4 x 5. 120 W.B., 34 x 4-inch tires.
 Chevrolet, H-3. Amesbury. Three-Passenger, \$985. Four, 3 11/16 x 4. 106 W.B., 32 x 3 1/2-inch tires.
 Buick, C-24. \$900. Four, 3 3/4 x 3 3/4. 106 W.B., 32 x 3 1/2-inch tires.
 Jeffery, Chesterfield, Six, \$1,650. Six, 3 x 5. 122 W.B., 34 x 4-inch tires.
 Regal, R. \$1,085. Four, 3 1/4 x 5. 112 W.B., 32 x 3 1/2-inch tires.
 Herff-Brooks, 4-40. \$1,100. Four, 4 1/4 x 5. 118 W.B., 34 x 4-inch tires.
 Scripps-Booth, \$775. Four, 2 3/4 x 4. 110 W.B., 30 x 3 1/2-inch tires.

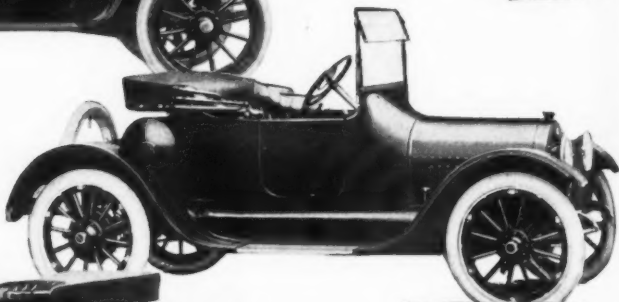


FORD

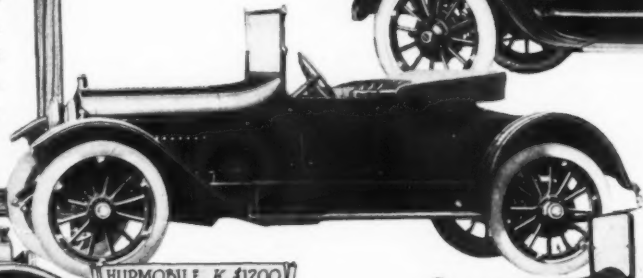


LEWIS

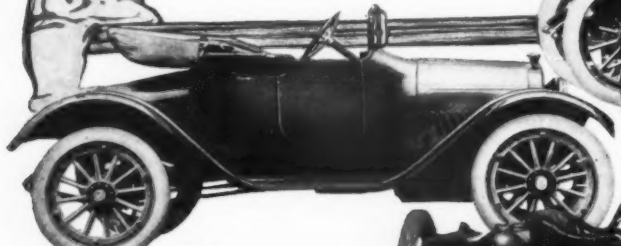
OVERLAND 81 \$795



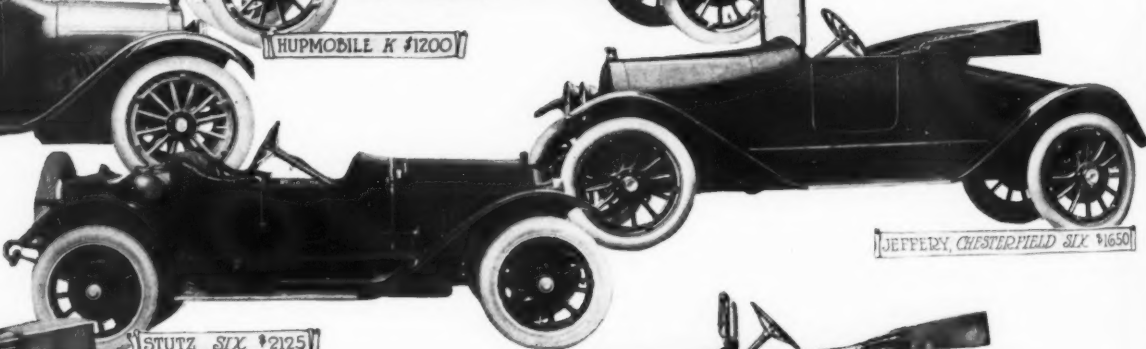
BUICK C-24 \$900



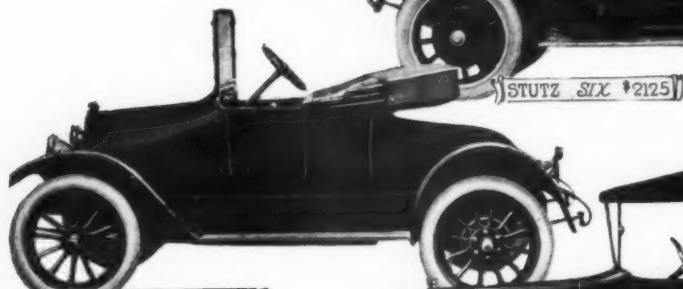
HUPMOBILE K \$1200



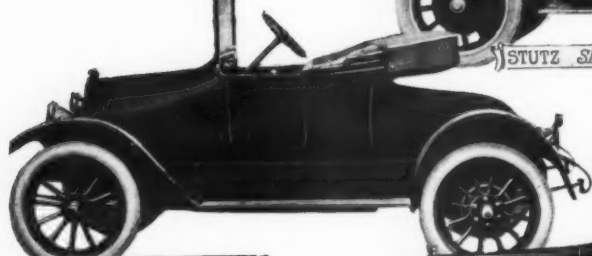
KRIT O \$850



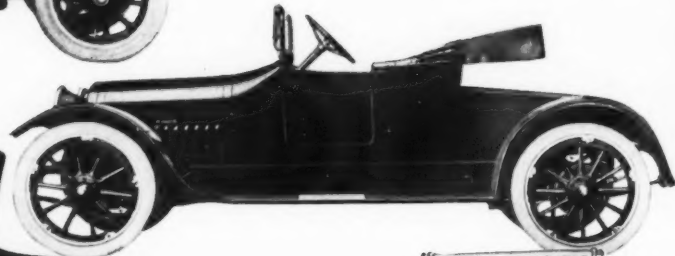
JEFFERY, CHESTERFIELD SIX \$1650



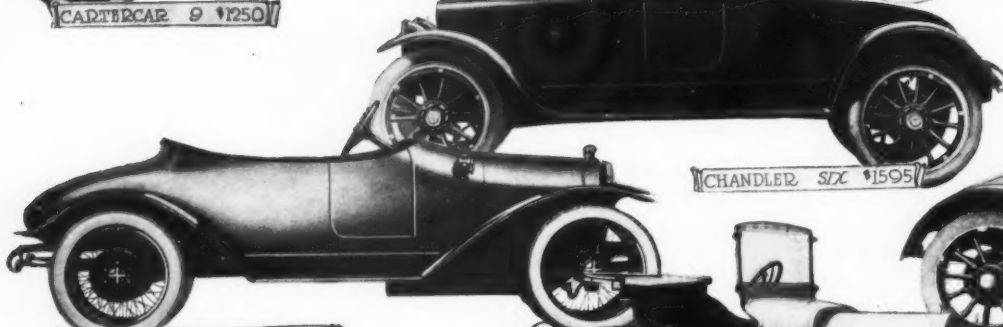
STUTZ SIX \$2125



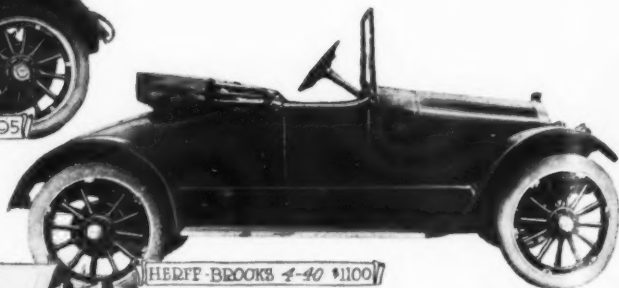
CARTERCAR 9 \$1250



REGAL R \$1085



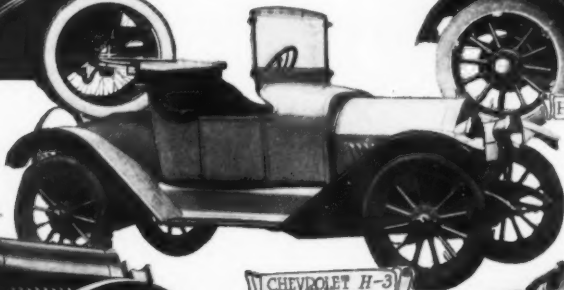
CHANDLER SIX \$1595



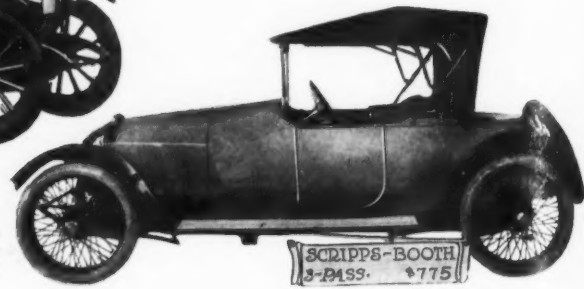
HERFF-BROOKS 4-40 \$1100



BRISCOE CLOVER LEAF \$785

CHEVROLET H-3
3-PASS. \$985

EMPIRE 31 \$875

SCRIPPS-BOOTH
3-PASS. \$775

and Speedsters

PAIGE

CHALMERS

BUICK 7-36 \$1185

HUDSON SIX 40 \$1550

MAXWELL \$670

PIERCE-ARROW 38 C 5 PASS \$4500

OAKLAND 37 \$1150

WESCOTT 30 \$1150

STUTZ H.C.S. \$1475

KING C \$1075

CHADWICK GREAT SIX \$5500

MOLINE-KNIGHT \$2500

McFARLAN 72 SERIES T \$2590

METZ 22 \$495

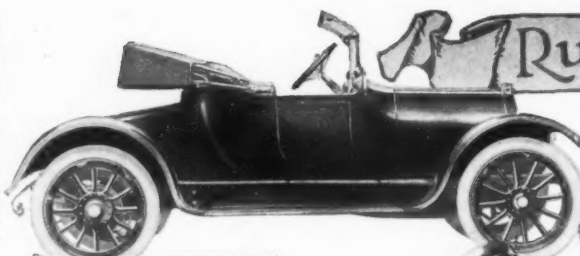
GRANT M \$425

DAVIS B-3 \$1235

Hudson, 6-40, \$1,550, Six, 3 1/4 x 5, 123 1/2 W.B., 34 x 4-inch tires.
 Pierce-Arrow, 38-C-3, \$4,300, Six, 4 x 5 1/4, 134 W.B., 36 x 4 1/2-inch tires.
 Stutz, H. C. S., \$1,475, Four, 3 3/4 x 5, 108 W.B., 32 x 4-inch tires.
 Moline-Knight, \$2,500, Four, 4 x 6, 128 W.B., 36 x 4 1/2-inch tires.
 Grant, M, \$425, Four, 2 3/4 x 4, 90 W.B., 28 x 3-inch tires.
 Buick, C-36, \$1,185, Four, 3 3/4 x 5, 112 W.B., 34 x 4-inch tires.
 Maxwell, \$670, Four, 3 3/4 x 4 1/2, 102 W.B., 30 x 3 1/2-inch tires.
 Westcott, 30, \$1,150, Four, 3 3/4 x 5, 113 W.B., 33 x 4-inch tires.
 Chadwick, 19, \$5,500, Six, 5 x 6, 112 W.B., 37 x 5-inch tires.
 Metz, 22, \$495, Four, 3 3/4 x 4, 96 W.B., 30 x 3-inch tires.
 Oakland, 37, \$1,150, Four, 3 3/4 x 5, 112 W.B., 33 x 4-inch tires.
 King, C, \$1,075, Four, 3 15/16 x 5, 113 W.B., 33 x 4-inch tires.
 McFarlan, 72, Six, Series T, \$2,590, Six, 4 x 6, 132 W.B., 36 x 4 1/2-inch tires; Series X, \$2,900, Six, 4 1/4 x 6, 132 W.B., 36 x 4 1/2-inch tires.
 Davis, B-38, \$1,235, Four, 3 3/4 x 5, 112 W.B., 34 x 4-inch tires.



Runabouts, Roadsters

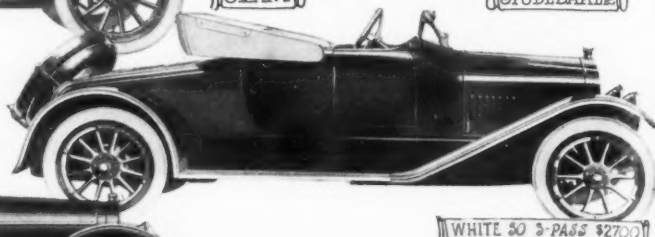


OVERLAND 80 \$1050

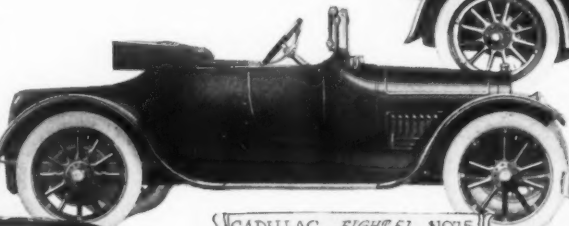


GRANT

STUDEBAKER



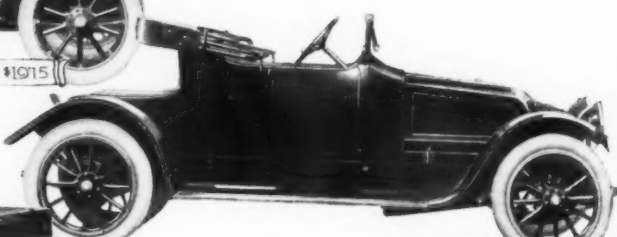
WHITE 30 3-PASS \$2700



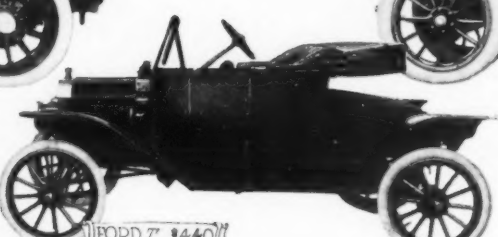
CADILLAC EIGHT 51 \$1915



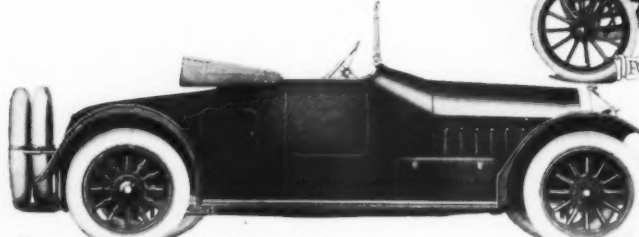
LOCOMOBILE R-4 \$4400



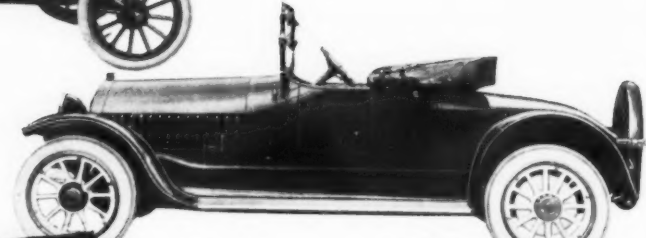
FRANKLIN \$2150



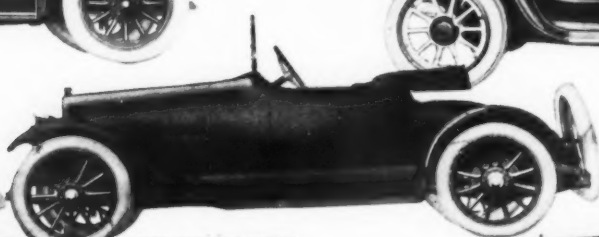
FORD 7 \$440



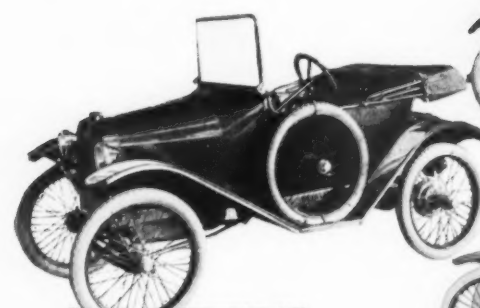
PATHFINDER DANIEL BOONE \$2222



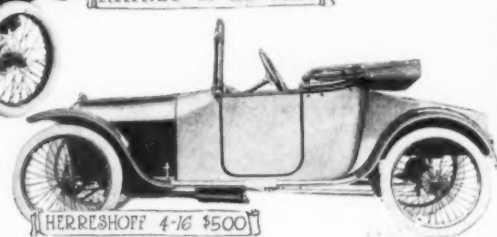
MARMON 41 \$3250



HAYNES 30-SIX \$1485



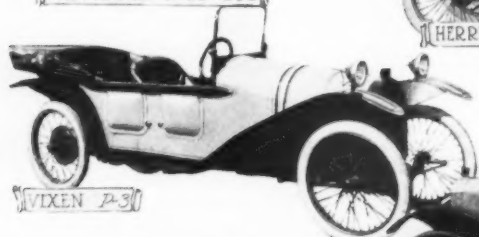
TRUMBULL 15-A \$395



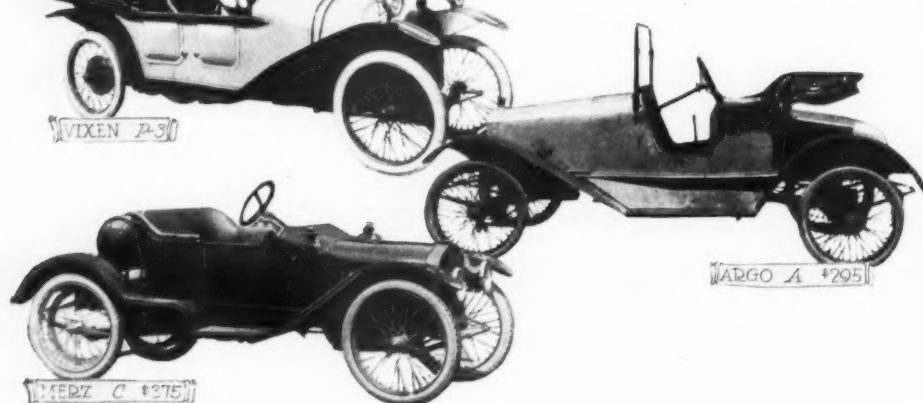
HERRESHOFF 4-16 \$500



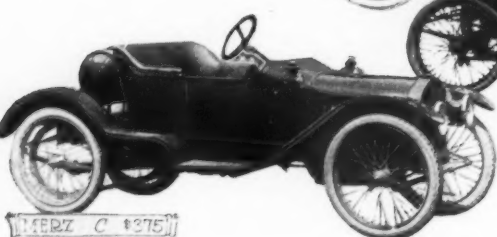
REO S-F



VIXEN P-3



LUGO A \$295



METZ C \$275

Locomobile, R-4, \$4,400, Six, 4 1/4 x 5, 132 W.B., 37 x 5-inch tires.
 Pathfinder, Daniel Boone, \$2,222, Six, 3 3/4 x 5 1/2, 125 W.B., 34 x 4 1/2-inch tires.
 Trumbull, 15-A, \$395, Four, 2 3/4 x 4, 80 W.B., 28 x 3-inch tires.
 Vixen, P-3, \$395, Four, 2 3/4 x 4, 106 W.B., 28 x 3-inch tires.
 Metz, C, \$375.
 Overland, 80, \$1,050, Four, 4 1/4 x 4 1/2, 114 W.B., 34 x 4-inch tires.
 Cadillac, Eight, \$1,975, Eight, 3 3/4 x 5 1/2, 122 W.B., 36 x 4 1/2-inch tires.
 Haynes, 30, \$1,485, Six, 3 1/2 x 5, 121 W.B., 34 x 4-inch tires.
 Herreshoff, 4-16, \$500, Four, 2 3/4 x 3 1/4, 94 W.B., 28 x 3-inch tires.
 Ford, T, \$440, Four, 3 3/4 x 4, 100 W.B., 30 x 3 1/2-inch tires.
 Argo, A, \$295, Four, 2 5/16 x 4, 90 W.B., 28 x 2 1/2-inch tires.
 White, 30, Three-Passenger Roadster, \$2,700, Four, 3 3/4 x 5 1/2, 115 W.B., 32 x 4 tires.
 Franklin, \$2,150, Six 3 3/4 x 4, 120 W.B.
 Marmon, 41, \$3,250, Six, 4 1/4 x 5 1/2, 132 1/2.
 Reo, S. T., Four, \$1,575, 4 1/4 x 4 1/2, 112 W.B.

and Speedsters Continued



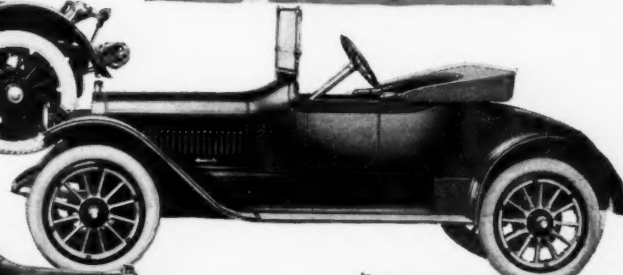
CHANDLER

STUDEBAKER FOUR
3 PASS. \$985

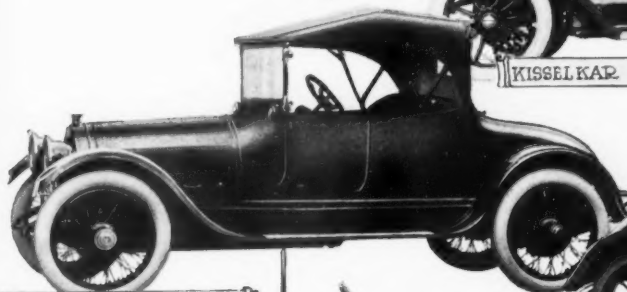
CHALMERS COUPELET 26B \$1900



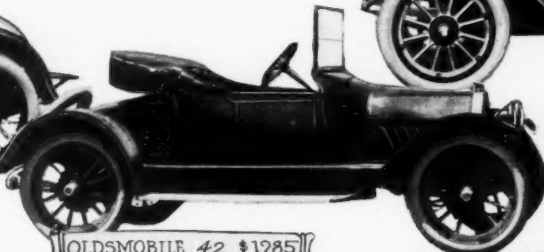
KISSEL KAR 36-FOUR \$1450



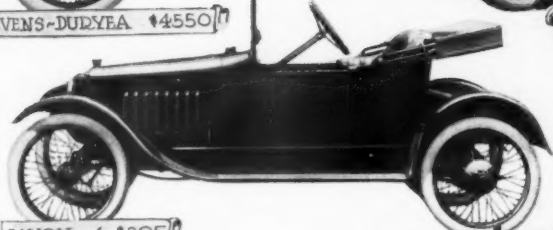
WINTON F-1 \$3250



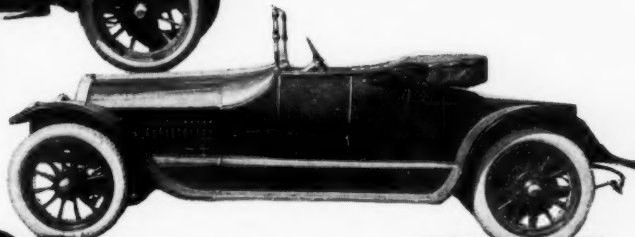
STEVENS-DURYEA \$4550



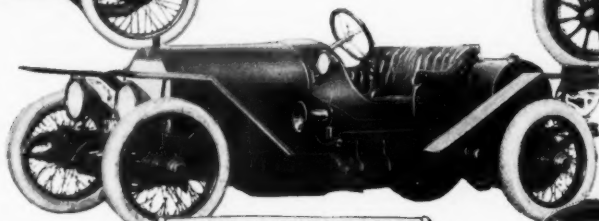
OLDSMOBILE 42 \$1285



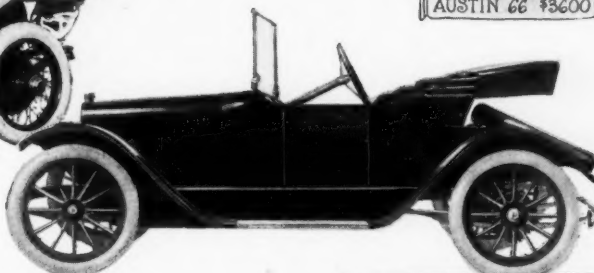
SAXON A \$395



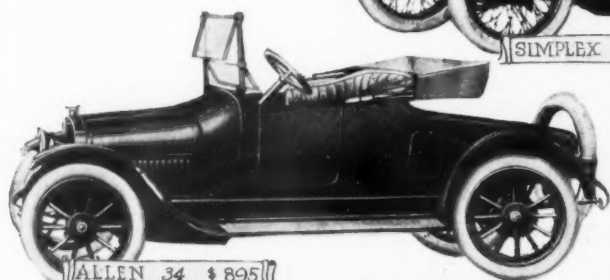
AUSTIN 66 \$3600



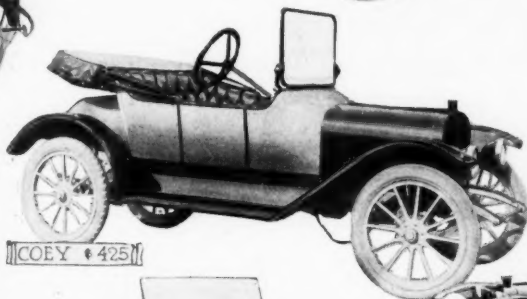
SIMPLEX SERIES F \$6900



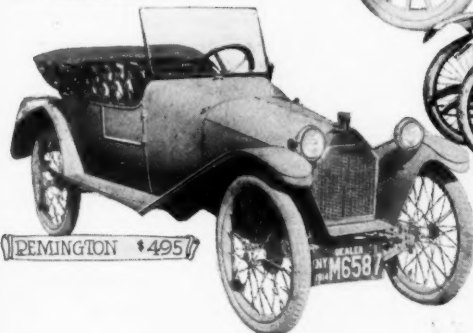
PARTIN-PALMER 20 \$495



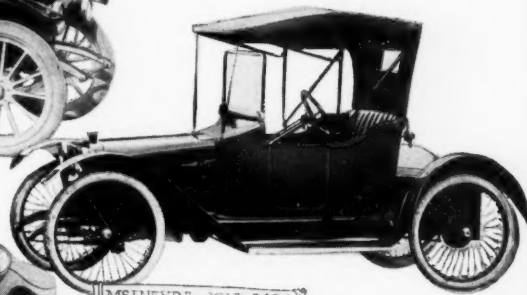
ALLEN 34 \$895



COEY \$425

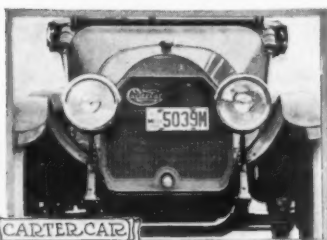


REMINGTON \$495

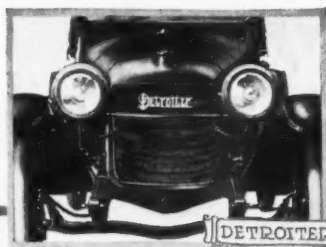
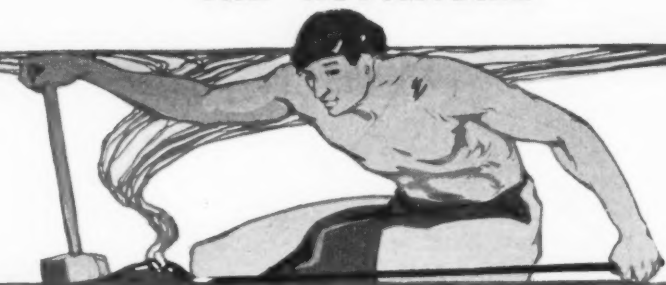


MCINTYRE 1915 \$490

Chalmers, 26B, Coupelet, \$1,900, Six, 3 1/2 x 5 1/2, 125 W.B., 34 x 4 1/2-inch tires.
 Stevens-Duryea, Disappearing Top, \$4,550, Six, 4 1/2 x 5 1/2, 131 W.B., 37 x 4 1/2-inch tires.
 Saxon, A, \$395, Four, 2 1/2 x 4, 96 W.B., 28 x 3-inch tires.
 Allen, 34, \$895, Four, 3 1/2 x 5, 110 W.B., 32 x 3 1/2-inch tires.
 Studebaker, Four, Three-Passenger, \$985, Four, 3 1/2 x 5, 108 W.B., 33 x 4-inch tires.
 Kisselkar, 36-4, \$1,450, Four, 4 1/2 x 5 1/2, 121 W.B., 34 x 4-inch tires.
 Oldsmobile, 42, \$1,285, Four, 3 1/2 x 5, 112 W.B., 33 x 4-inch tires.
 Simplex, Model F, \$6,900, Six, 3 1/2 x 5 1/2, 130 W.B., 35 x 4 1/2-inch tires.
 Coey, Four, \$425, Four 2 1/2 x 4 1/2, 96 W.B., 28 x 3-inch tires.
 McIntyre, 1915, \$490, Four, 2 1/2 x 4, 100 W.B., 28 x 3-inch tires.
 Remington, \$495, Four, 2 1/2 x 4, 100 W.B., 28 x 3-inch tires.
 Winton, F-1, \$3,250, Six, 4 1/2 x 5 1/2, 130 W.B., 37 x 5-inch tires.
 Austin, 66, \$3,600, Six, 4 1/2 x 6, 141 W.B., 34 x 4 1/2-inch tires.
 Partin-Palmer, 20, \$495, Four, 3 1/2 x 4, 96 W.B., 28 x 3-inch tires.

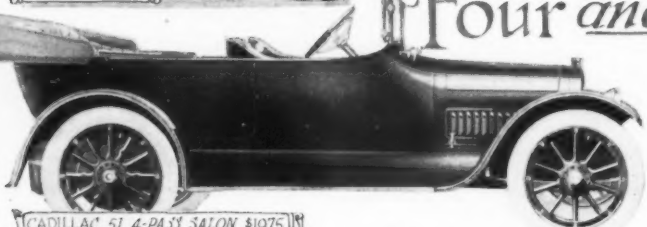


CARTER CAR

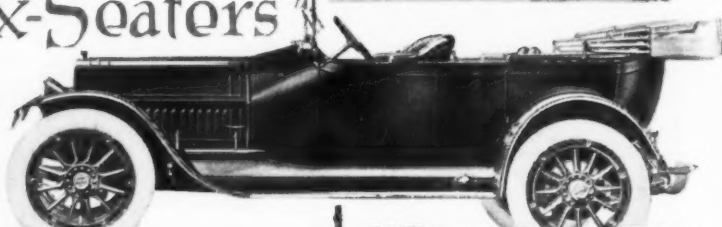


DETROIT

Four and Six-Seaters



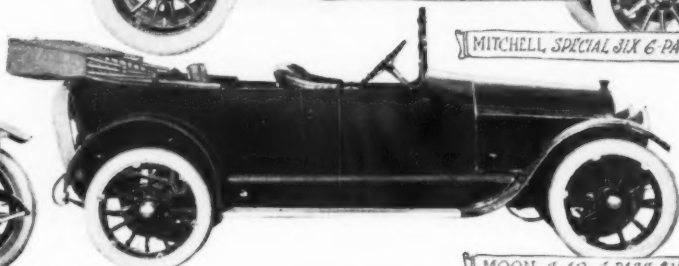
CADILLAC 51 4-PASS SALON \$1975



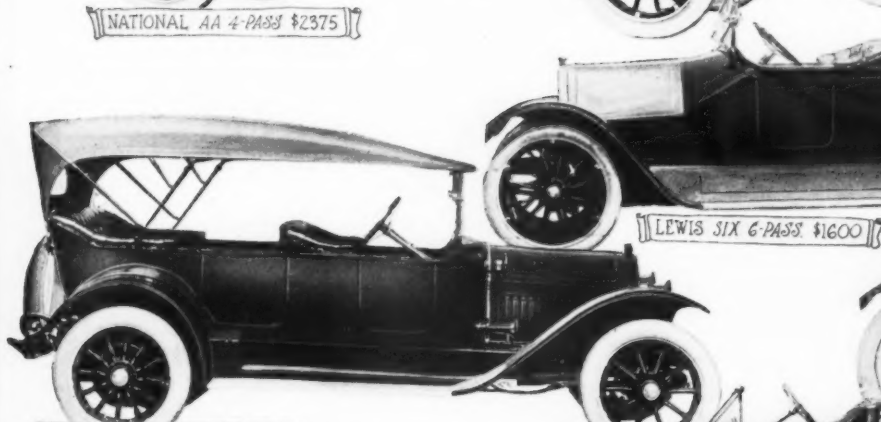
MITCHELL SPECIAL SIX 6-PASS \$1995



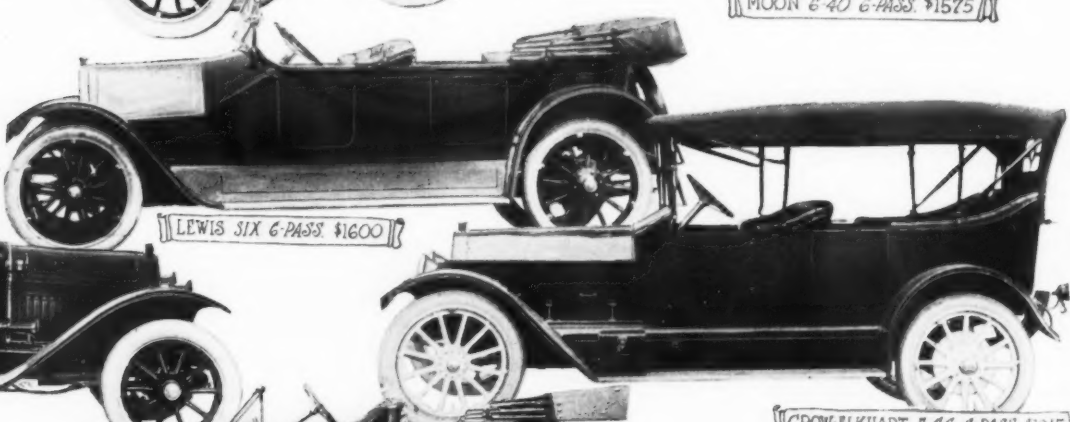
NATIONAL AA 4-PASS \$2375



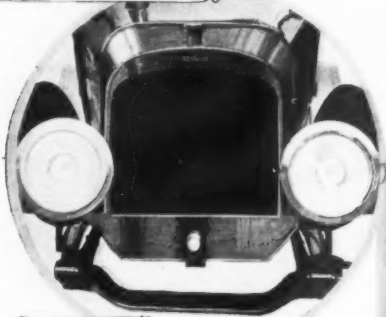
MOON 6-40 6-PASS \$1575



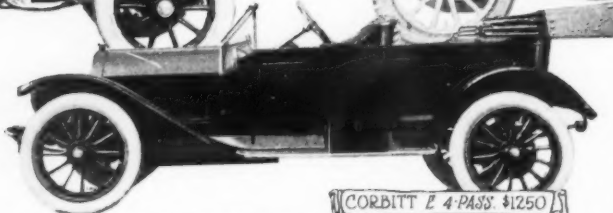
STUTZ SIX 6-PASS \$2450



LEWIS SIX 6-PASS \$1600



MONARCH

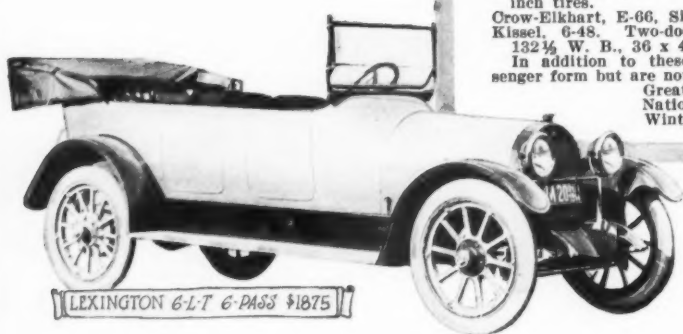


CORBITT E 4-PASS \$1250

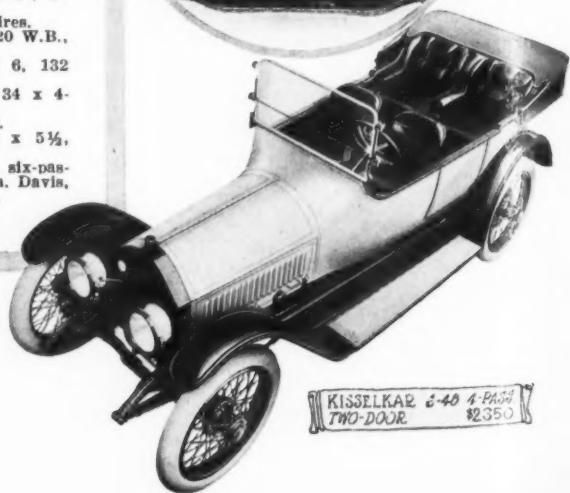


CROW-ELKHART E-66 6-PASS \$1945

AUSTIN



LEXINGTON 6-LT 6-PASS \$1875



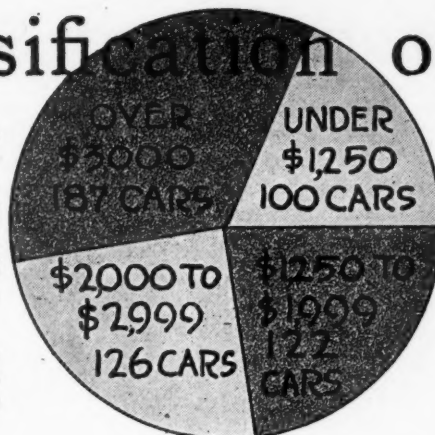
KISSELKAR 6-40 4-PASS TWO-DOOR \$2350

Cadillac, 51 Salon, Eight, $3\frac{1}{2} \times 5\frac{1}{2}$, Four-passenger, \$1,975, 122 W.B., 36 x $4\frac{1}{2}$ -inch tires.
 National, A. A., Six, $3\frac{1}{2} \times 5\frac{1}{2}$, Four-passenger, \$2,375, 132 W.B., 36 x $4\frac{1}{2}$ -inch tires.
 Stutz, Touring, Six-passenger, Four, $4\frac{1}{2} \times 5\frac{1}{2}$, \$2,275, Six, 4 x 5, \$2,450, 130 W.B., 34 x $4\frac{1}{2}$ -inch tires.
 Lexington, 6-L-T, $3\frac{1}{2} \times 5$, Six-passenger, \$1,875, 128 W.B., 34 x 4-inch tires.
 Lewis, Six, Six-passenger, \$1,600, 135 W.B., 36 x 4-inch tires.
 Corbitt, Model E, Four, $4 \times 4\frac{1}{2}$, Four-passenger, \$1,250, 120 W.B., 34 x 4-inch tires.
 Mitchell, Special Six, Six-passenger, \$1,995, Six, $4\frac{1}{2} \times 6$, 132 W.B., 36 x 4-inch tires.
 Moon, 6-40, $3\frac{1}{2} \times 5$, Six-passenger, \$1,575, 122 W.B., 34 x 4-inch tires.
 Crow-Elkhart, E-66, Six-passenger, \$1,945, $3\frac{1}{2} \times 5\frac{1}{2}$, 130.
 Kissel, 6-48, Two-door, Four-passenger, \$2,350, Six, 4 x $5\frac{1}{2}$, 132 $\frac{1}{2}$ W. B., 36 x $4\frac{1}{2}$ -inch tires.
 In addition to these, the following cars are made in six-passenger form but are not illustrated as such: Auburn, Austin, Davis, Great Western, Locomobile, McFarlan, National, Packard, Stearns-Knight, Velie, Winton.

Price Classification of 1915 Cars

IN the following tables is given a list of American cars listed under four price classifications. These classes are divided as follows: The first includes all cars listing up to \$1,250, the second all those from \$1,250 to \$1,999, the third from \$2,000 to \$2,999 and the fourth above \$3,000.

These tables are a guide to the buyer. They tell him the type of body he can get on a car of any price. They give



the power of the motor, the length of wheelbase, the tire size and left or right drive. The average price of cars in these four classes are as follows: \$855, \$1,419, \$2,454, and \$4,563. This is a reduction all along the line as compared with 1914 when the four prices of average cars were respectively \$950, \$1,650, \$2,460 and \$4,700. The average price for 1915 of all American cars is \$2,005, for 1914 it was \$2,635.

Automobiles Listed Under \$1250

| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
|-----------------------|----------------------------------|-------|------------------|----------------|------------------|------------------|----------------------|
| Allen, 34 | Roadster, 2 | 895 | 4 | 21.08 | 110 | 32x3 | Left |
| Allen, 34 | Touring, 5 | 895 | 4 | 21.08 | 110 | 32x3 | Left |
| Alter, 4-27 | Touring, 5 | 685 | 4 | 22.50 | 106 | 30x3 | Left |
| Argo | Roadster, 2 | 295 | 4 | 8.52 | 90 | 28x2 | Left |
| Auburn, 4-36 | Roadster, 2 | 1,075 | 4 | 22.50 | 114 | 32x4 | Left |
| Auburn, 4-36 | Touring, 5 | 1,075 | 4 | 22.50 | 114 | 32x4 | Left |
| Bauer, 30 | Roadster, 2 | 875 | 4 | 22.50 | 110 | 34x3 | Left |
| Bauer, 30 | Touring, 5 | 1,000 | 4 | 22.50 | 110 | 34x3 | Left |
| Briscoe | Roadster, 3 | 785 | 4 | 15.64 | 107 | 30x3 | Opt. |
| Briscoe | Touring, 5 | 785 | 4 | 15.64 | 107 | 30x3 | Opt. |
| Buick, C-24 | Roadster, 2 | 900 | 4 | 22.50 | 106 | 32x3 | Left |
| Buick, C-25 | Touring, 5 | 950 | 4 | 22.50 | 106 | 32x3 | Left |
| Buick, C-36 | Roadster, 2 | 1,185 | 4 | 22.50 | 112 | 34x4 | Left |
| Buick, C-37 | Touring, 5 | 1,235 | 4 | 22.50 | 112 | 34x4 | Left |
| Chevrolet, Baby Grand | Touring, 5 | 985 | 4 | 21.74 | 106 | 32x3 | Left |
| Chevrolet, Royal Mail | Roadster, 2 | 860 | 4 | 21.74 | 106 | 32x3 | Left |
| Crow-Elkhart, E-42 | Roadster, 2 | 1,150 | 4 | 25.60 | 114 | 33x4 | Right |
| Crow-Elkhart, E-45 | Touring, 5 | 1,185 | 4 | 25.60 | 114 | 33x4 | Right |
| Cycleplane-Tourist | Roadster, 2 | 350 | 4 | 10.00 | 108 | 28x3 | Left |
| Cycleplane-Tourist | Touring, 3 | 400 | 4 | 10.00 | 108 | 28x3 | Left |
| Cycleplane-Traveler | Tandem, 2 | 250 | 2 | 9.11 | 96 | 28x2 | Centre |
| Davis, 38-A | Roadster, 2 | 1,235 | 4 | 22.50 | 112 | 34x4 | Left |
| Davis, 38-B | Touring, 5 | 1,235 | 4 | 22.50 | 112 | 34x4 | Left |
| Detroit, C | Touring, 5 | 985 | 4 | 19.61 | 112 | 32x3 | Left |
| Dile, A | Roadster, 2 | 485 | 4 | 11.23 | 96 | 28x3 | Left |
| Dodge | Touring, 5 | 785 | 4 | 24.22 | 110 | 32x3 | Left |
| Empire, 31-40 | Roadster, 2 | 875 | 4 | 22.50 | 108 | 32x3 | Left |
| Empire, 31-40 | Touring, 5 | 975 | 4 | 22.50 | 108 | 32x3 | Left |
| Empire, 31-40 | Touring, 5 | 850 | 4 | 22.50 | 108 | 32x3 | Left |
| Empire, 31-40 | Touring, 5 | 975 | 4 | 22.50 | 108 | 32x3 | Left |
| Ford, T | Roadster, 2 | 440 | 4 | 22.50 | 100 | 30x3 | Left |
| Ford, T | Touring, 5 | 490 | 4 | 22.50 | 100 | 30x3 | Left |
| Ford, T | Coupelet, 2 | 750 | 4 | 22.50 | 100 | 30x3 | Left |
| Ford, T | Town Car, 6 | 690 | 4 | 22.50 | 100 | 30x3 | Left |
| Ford, T | Sedan, 5 | 975 | 4 | 22.50 | 100 | 30x3 | Left |
| Glide, 30 | Roadster, 2 | 1,195 | 4 | 19.61 | 114 | 32x4 | Left |
| Glide, 30 | Touring, 5 | 1,195 | 4 | 19.61 | 114 | 32x4 | Left |
| Grant, M | Roadster, 2 | 505 | 4 | 12.08 | 90 | 28x3 | Left |
| Grant, T | Roadster, 2 | 750 | 6 | 20.00 | 106 | 30x3 | Left |
| Grant, T | Touring, 5 | 750 | 6 | 20.00 | 106 | 30x3 | Left |
| Herff-Brooks, 4-40 | Roadster, 2 | 1,100 | 4 | 32.40 | 118 | 34x4 | Left |
| Herff-Brooks, 4-40 | Touring, 5 | 1,100 | 4 | 32.40 | 118 | 34x4 | Left |
| Herreshoff 4-16 | Roadster, 2 | 500 | 4 | 12.08 | 94 | 28x3 | Left |
| Hupmobile, H | Roadster, 2 | 1,050 | 4 | 16.92 | 106 | 33x4 | Right |
| Hupmobile, H | Touring, 5 | 1,050 | 4 | 16.92 | 106 | 33x4 | Right |
| Hupmobile, K | Roadster, 2 | 1,200 | 4 | 18.21 | 119 | 34x4 | Left |
| Hupmobile, K | Touring, 5 | 1,200 | 4 | 18.21 | 119 | 34x4 | Left |
| Imperial, 64 | Touring, 5 | 1,085 | 4 | 22.50 | 115 | 32x3 | Left |
| Inter-State, 71 | Touring, 5 | 1,000 | 4 | 19.61 | 110 | 33x4 | Left |
| Kearns-Kar | Roadster, 2 | 450 | 4 | 13.37 | 100 | 28x3 | Opt. |
| Kearns-Kar | Speedster, 2 | 450 | 4 | 13.37 | 100 | 28x3 | Opt. |
| King | Roadster, 2 | 1,165 | 4 | 24.91 | 113 | 33x4 | Left |
| King | Touring, 5 | 1,165 | 4 | 24.91 | 113 | 33x4 | Left |
| Krit, O | Roadster, 2 | 850 | 4 | 22.50 | 108 | 32x3 | Left |
| Krit, O | Touring, 5 | 850 | 4 | 22.50 | 108 | 32x3 | Left |
| Krit, M | Roadster, 3 | 995 | 4 | 22.50 | 108 | 32x3 | Left |
| Krit, M | Touring, 5 | 995 | 4 | 22.50 | 108 | 32x3 | Left |
| Lambert, 48-C | Touring, 5 | 1,200 | 4 | 22.50 | 112 | 32x3 | Left |
| Maxwell, 25 | Roadster, 2 | 670 | 4 | 21.09 | 102 | 30x3 | Left |
| Maxwell, 25 | Touring, 5 | 695 | 4 | 21.09 | 102 | 30x3 | Left |
| McIntyre, 25 | Touring, 5 | 695 | 4 | 22.50 | 106 | 30x3 | Left |
| Meteor, 42 | Touring, 5 | 1,075 | 4 | 25.60 | 114 | 34x4 | Left |
| Metz, 22 | Roadster, 2 | 495 | 4 | 22.50 | 96 | 30x3 | Left |
| Oakland, 37 | Roadster, 2 | 1,150 | 4 | 19.61 | 112 | 33x4 | Left |
| Oakland, 37 | Touring, 5 | 1,200 | 4 | 19.61 | 112 | 33x4 | Left |
| Overland, 80 | Roadster, 2 | 1,050 | 4 | 27.20 | 114 | 34x4 | Left |
| Overland, 80 | Touring, 5 | 1,075 | 4 | 27.20 | 114 | 34x4 | Left |
| Overland, 81 | Roadster, 2 | 795 | 4 | 25.60 | 106 | 33x4 | Left |
| Overland, 81 | Touring, 5 | 850 | 4 | 25.60 | 106 | 33x4 | Left |
| Partin-Palmer, 20 | Roadster, 2 | 495 | 4 | 15.64 | 96 | 28x3 | Left |
| Partin-Palmer, 38 | Touring, 6 | 1,075 | 4 | 22.50 | 115 | 33x4 | Left |
| Paterson, 4-32 | Touring, 5 | 1,095 | 4 | 19.61 | 112 | 33x4 | Left |
| Peter Pan | Touring, 4 | 685 | 4 | 12.08 | 110 | 29x3 | Left |
| Peter Pan | Roadster, 2 | 650 | 4 | 12.08 | 110 | 29x3 | Left |
| Pullman, Junior | Roadster, 3 | 740 | 4 | 25.60 | 110 | 30x3 | Left |
| Pullman, Junior | Touring, 5 | 740 | 4 | 25.60 | 110 | 30x3 | Left |
| Rayfield, 20 | Roadster, 2 | 395 | 4 | 12.08 | 96 | 28x3 | Left |
| R.C.H., K | Touring, 5 | 900 | 4 | 16.92 | 110 | 32x3 | Opt. |
| Regal, D | Roadster, 2 | 1,085 | 4 | 22.50 | 112 | 32x3 | Opt. |
| Regal, D | Touring, 5 | 1,085 | 4 | 22.50 | 112 | 32x3 | Opt. |
| Remington | Roadster, 2 | 595 | 4 | 12.08 | 106 | 30x3 | Left |
| Remington | Touring, 5 | 695 | 4 | 12.08 | 109 | 30x3 | Left |
| Saxon | Roadster, 2 | 395 | 4 | 11.23 | 96 | 28x3 | Left |
| Saxon | Touring, 5 | 785 | 6 | ..... | 112 | ..... | Left |
| Scripps-Booth, C | Roadster, 3 | 775 | 4 | 13.37 | 110 | 30x3 | Left |
| Scripps-Booth, C | Cabriolet, 3 | ..... | 4 | 13.37 | 110 | 30x3 | Left |
| Scripps-Booth, C | Coupe, 3 | ..... | 4 | 13.37 | 110 | 30x3 | Left |
| Sphinx, 8-15 | Touring, 5 | 695 | 4 | 18.21 | 112 | 30x3 | Left |
| Studebaker, 4-SD | Roadster, 3 | 985 | 4 | 19.61 | 108 | 33x4 | Left |
| Studebaker, 4-SD | Touring, 5 | 985 | 4 | 19.61 | 108 | 33x4 | Left |
| Trumbull, 15-A | Roadster, 2 | 395 | 4 | ..... | 80 | 28x3 | Opt. |
| Trumbull, 15-A | Coupe, 2 | 600 | 4 | ..... | 80 | 28x3 | Opt. |
| Twombly | Roadster, 2 | 600 | 4 | 15.64 | 100 | 30x3 | Left |
| Twombly | Town Car, 3 | 750 | 4 | 15.64 | 100 | 30x3 | Left |
| Vixen | Touring, 3 | ..... | 4 | 12.05 | 106 | 28x3 | Right |
| Vulcan, 35 | Touring, 5 | 975 | 4 | 19.60 | 120 | 32x3 | Left |
| Vulcan, 35 | Roadster, 2 | 975 | 4 | 19.60 | 120 | 32x3 | Left |
| Westcott, O | Speedster, 2 | 1,150 | 4 | 19.61 | 113 | 33x4 | Left |
| Westcott, O | Roadster, 2 | 1,150 | 4 | 19.61 | 113 | 33x4 | Left |
| Westcott, O | Touring, 5 | 1,150 | 4 | 19.61 | 113 | 33x4 | Left |

*Rear tires only; front a size smaller.

Automobiles Listing from \$1,250 to \$1,999

IN this price class which includes more chassis than any other, are the popular \$1,500 cars. It is here that the low-priced six has come into its own. While last year only 19 per cent. of the chassis in this price class had six-cylinder motors, this year the percentage has jumped to 55. The number of four-cylinder cars has dropped during the last year from 81 per cent. to 40.2. Two makers of eight-cylinder cars have entered this field bringing the percentage of chassis so equipped up to 4.1. There are now nearly as many eight-cylinder cars available in this price classification as there were six-cylinder cars in 1912.

| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
|---------------------------|----------------------------------|-------|------------------|----------------|------------------|------------------|----------------------|
| Abbott-Detroit, K. | Touring, 5 | 1,785 | 4 | 27.20 | 116 | 34x4 | Right |
| Ames, 44 | Roadster, 2 | 1,745 | 4 | 27.20 | 118 | 36x4 | Left |
| Ames, 45 | Touring, 5 | 1,785 | 4 | 27.20 | 118 | 36x4 | Left |
| Apperson, 4-40 | Touring, 5 | 1,350 | 4 | 25.60 | 116 | 34x4 | Left |
| Apperson, 6-45 | Touring, 7 | 1,585 | 6 | 29.45 | 126 | 34x4 | Left |
| Arbenz | Roadster, 2 | 1,825 | 4 | 27.20 | 120 | 36x4 | Opt. |
| Arbenz | Touring, 5 | 1,885 | 4 | 27.20 | 120 | 36x4 | Opt. |
| Auburn, 6-40 | Roadster, 2 | 1,550 | 6 | 29.45 | 126 | 34x4 | Left |
| Auburn, 6-40 | Touring, 6 | 1,550 | 6 | 29.45 | 126 | 34x4 | Left |
| Briscoe, B. | Coupe, 2 | 1,250 | 4 | 15.64 | 107 | 30x3 | Opt. |
| Buick, C-54 | Roadster, 2 | 1,650 | 6 | 33.75 | 130 | 36x4 | Left |
| Buick, C-55 | Touring, 7 | 1,650 | 6 | 33.75 | 130 | 35x4 | Left |
| Cadillac, 51 | Roadster, 2 | 1,975 | 8 | 31.28 | 122 | 36x4 | Left |
| Cadillac, 51 | Touring, 5 | 1,975 | 8 | 31.28 | 122 | 36x4 | Left |
| Cadillac, 51 | Touring, 7 | 1,975 | 8 | 31.28 | 122 | 36x4 | Left |
| Cadillac, 51 | Salon, 4 | 1,975 | 8 | 31.28 | 122 | 36x4 | Left |
| Cartercar, 9 | Roadster, 2 | 1,250 | 4 | 19.61 | 106 | 33x4 | Right |
| Cartercar, 9 | Touring, 5 | 1,250 | 4 | 19.61 | 106 | 33x4 | Right |
| Case, 25 | Touring, 5 | 1,350 | 4 | 22.50 | 115 | 34x4 | Left |
| Case, 35 | Touring, 5 | 1,600 | 4 | 29.00 | 120 | 35x4 | Left |
| Case, 40 | Touring, 5 | 1,800 | 4 | 32.40 | 124 | 37x4 | Right |
| Chalmers, 26-B | Touring, 5 | 1,650 | 6 | 29.45 | 125 | 34x4 | Left |
| Chalmers, 26-B | Touring, 7 | 1,725 | 6 | 29.45 | 125 | 34x4 | Left |
| Chalmers, 26-B | Coupelet, 2 | 1,900 | 6 | 29.45 | 125 | 34x4 | Left |
| Chandler, 15 | Touring, 5 | 1,595 | 6 | 27.30 | 120 | 34x4 | Left |
| Chandler, 15 | Cabriolet, 3 | 1,950 | 6 | 27.30 | 120 | 34x4 | Left |
| Cole, 4-40 | Roadster, 2 | 1,485 | 4 | 29.00 | 118 | 34x4 | Left |
| Cole, 4-40 | Touring, 7 | 1,485 | 4 | 29.00 | 118 | 34x4 | Left |
| Cole, 4-40 | Coupe, 3 | 1,885 | 4 | 29.00 | 118 | 34x4 | Left |
| Cole, 6-50 | Roadster, 2 | 1,865 | 6 | 29.45 | 126 | 35x4 | Left |
| Cole, 6-50 | Touring, 4 | 1,865 | 6 | 29.45 | 126 | 35x4 | Left |
| Cole, 6-50 | Touring, 7 | 1,865 | 6 | 29.45 | 126 | 35x4 | Left |
| Corbitt | Touring, 4 | 1,600 | 4 | 25.60 | 120 | 34x4 | Right |
| Corbitt | Touring, 5 | 1,650 | 4 | 25.60 | 120 | 34x4 | Right |
| Crawford, 6-35 | Roadster, 2 | 1,850 | 6 | 29.45 | 120 | 34x4 | Left |
| Crawford, 6-35 | Touring, 5 | 1,850 | 6 | 29.45 | 120 | 34x4 | Left |
| Crow-Elkhart, E-52 | Roadster, 2 | 1,575 | 4 | 29.00 | 120 | 34x4 | Right |
| Crow-Elkhart, E-54 | Touring, 4 | 1,625 | 4 | 29.00 | 120 | 34x4 | Right |
| Crow-Elkhart, E-55 | Touring, 5 | 1,600 | 4 | 29.00 | 120 | 34x4 | Right |
| Crow-Elkhart, E-56 | Touring, 6 | 1,650 | 4 | 29.00 | 120 | 34x4 | Right |
| Enger, 6-50 | Roadster, 2 | 1,495 | 6 | 29.45 | 125 | 34x4 | Left |
| Enger, 6-50 | Touring, 7 | 1,495 | 6 | 29.45 | 125 | 34x4 | Left |
| Firestone-Columbus, 82-E | Roadster, 2 | 1,925 | 4 | 27.20 | 116 | 34x4 | Left |
| Firestone-Columbus, 86-E | Touring, 5 | 1,925 | 4 | 27.20 | 116 | 34x4 | Left |
| Great Western, A | Roadster, 2 | 1,710 | 4 | 29.00 | 117 | 36x4 | Right |
| Great Western, A | Touring, 4 | 1,710 | 4 | 29.00 | 117 | 36x4 | Right |
| Great Western, A | Touring, 5 | 1,710 | 4 | 29.00 | 117 | 36x4 | Right |
| Haynes, 32 | Touring, 5 | 1,660 | 4 | 29.00 | 118 | 34x4 | Left |
| Haynes, 30 | Roadster, 2 | 1,485 | 6 | 29.45 | 121 | 34x4 | Left |
| Haynes, 30 | Touring, 5 | 1,485 | 6 | 29.45 | 121 | 34x4 | Left |
| Herff-Brooks, 6-50 | Roadster, 2 | 1,375 | 6 | 38.40 | 124 | 34x4 | Left |
| Herff-Brooks, 6-50 | Touring, 5 | 1,375 | 6 | 38.40 | 124 | 34x4 | Left |
| Hudson, 6-40 | Roadster, 3 | 1,550 | 6 | 29.45 | 123 | 34x4 | Left |
| Hudson, 6-40 | Phaeton, 7 | 1,550 | 6 | 29.45 | 123 | 34x4 | Left |
| Hudson, 6-40 | Cabriolet, 4 | 1,750 | 6 | 29.45 | 123 | 34x4 | Left |
| Jackson, Olympic | Roadster, 3 | 1,375 | 4 | 32.40 | 117 | 34x4 | Left |
| Jackson, Olympic | Touring, 5 | 1,375 | 4 | 32.40 | 117 | 34x4 | Left |
| Jackson, 48 | Touring, 5 | 1,650 | 6 | 29.45 | 125 | 34x4 | Left |
| Jeffery, 4 | Roadster, 2 | 1,525 | 4 | 22.50 | 110 | 34x4 | Left |
| Jeffery, 4 | Touring, 5 | 1,450 | 4 | 22.50 | 116 | 34x4 | Left |
| Jeffery, 4 | Convert'l, 2 | 1,750 | 4 | 22.50 | 116 | 34x4 | Left |
| Jeffery, Chesterfield | Roadster, 2 | 1,650 | 6 | 21.60 | 122 | 34x4 | Left |
| Jeffery, Chesterfield | Touring, 5 | 1,650 | 6 | 21.60 | 122 | 34x4 | Left |
| Jeffery, Chesterfield | Convert'l, 2 | 1,950 | 6 | 21.60 | 122 | 34x4 | Left |
| King | Cabriolet, 2 | 1,480 | 4 | 24.91 | 113 | 33x4 | Left |
| King, D | Touring, 5 | 1,350 | 8 | 24.16 | 113 | 33x4 | Left |
| Kissel, 4-36 | Roadster, 2 | 1,450 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 4-36 | Touring, 5 | 1,450 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 4-36 | Touring, 5** | 1,450 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 4-36 | Touring, 7 | 1,550 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 4-36 | Sedan, 5 | 1,800 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 4-36 | Cabriolet, 2 | 1,750 | 4 | 29.00 | 121 | 34x4 | Left |
| Kissel, 42 | Touring | ... | 6 | 31.32 | 126 | 35x4 | Left |
| Kline, 6-42 | Roadster, 2 | 1,750 | 6 | 29.45 | 123 | 34x4 | Left |
| Kline, 6-42 | Toy Tour, 4 | 1,750 | 6 | 29.45 | 123 | 34x4 | Left |
| Kline, 6-42 | Touring, 5 | 1,750 | 6 | 29.45 | 123 | 34x4 | Left |
| Kline, 6-42 A | Touring, 7 | 1,850 | 6 | 29.45 | 127 | 35x4 | Left |
| Krit, M. | Cabriolet, 3 | 1,295 | 4 | 22.50 | 108 | 32x3 | Left |
| Lambert, 68 | Roadster, 3 | 1,565 | 4 | 27.20 | 117 | 34x3 | Right |
| Lambert, 68 | Touring, 5 | 1,565 | 4 | 27.20 | 117 | 34x3 | Right |
| Lewis, 6 | Roadster, 2 | 1,600 | 6 | 29.45 | 135 | 36x4 | Left |
| Lewis, 6 | Touring, 6 | 1,600 | 6 | 29.45 | 135 | 36x4 | Left |
| Lexington, 6-L | Roadster, 3 | 1,875 | 6 | 29.45 | 128 | 34x4 | Left |
| Lexington, 6-L | Touring, 6 | 1,875 | 6 | 29.45 | 128 | 34x4 | Left |
| McIntyre, 6-40 | Touring, 5 | 1,275 | 6 | 29.45 | 120 | 35x4 | Right |
| Meteor, 45 | Touring, 5 | 1,395 | 6 | 33.75 | 126 | 35x4 | Left |
| Mitchell-Lewis, 4 | Roadster, 2 | 1,250 | 4 | 25.60 | 116 | 34x4 | Left |
| Mitchell-Lewis, 4 | Touring, 5 | 1,250 | 4 | 25.60 | 116 | 34x4 | Left |
| Mitchell-Lewis, 4 | Touring, 6 | 1,300 | 4 | 25.60 | 116 | 34x4 | Left |
| Mitchell-Lewis, 6 | Roadster, 2 | 1,585 | 6 | 38.40 | 127 | 36x4 | Left |
| Mitchell-Lewis, 6 | Touring, 5 | 1,585 | 6 | 38.40 | 127 | 36x4 | Left |
| Mitchell-Lewis, 6 | Touring, 6 | 1,585 | 6 | 38.40 | 127 | 36x4 | Left |
| Mitchell-Lewis, Special 6 | Roadster, 2 | 1,895 | 6 | 43.50 | 132 | 36x4 | Left |
| Mitchell-Lewis, Special 6 | Touring, 5 | 1,895 | 6 | 43.50 | 132 | 36x4 | Left |
| Mitchell-Lewis, Special 6 | Touring, 6 | 1,995 | 6 | 43.50 | 132 | 36x4 | Left |
| Monarch, 6 | Touring, 5 | 1,250 | 6 | 29.45 | 125 | 33x4 | Left |
| Monarch, 6 | Touring, 7 | 1,275 | 6 | 29.45 | 125 | 33x4 | Left |
| Mon, 4-38 | Roadster, 3 | 1,350 | 4 | 22.50 | 122 | 34x4 | Left |
| Mon, 4-38 | Touring, 5 | 1,350 | 4 | 22.50 | 122 | 34x4 | Left |
| Mon, 6-40 | Roadster, 3 | 1,575 | 6 | 29.45 | 122 | 34x4 | Left |
| Mon, 6-40 | Touring, 6 | 1,575 | 6 | 29.45 | 122 | 34x4 | Left |
| Norwalk, F | Roadster, 2 | 1,875 | 6 | 29.45 | 131 | 37x4 | Left |
| Norwalk, F | Touring, 4 | 1,875 | 6 | 29.45 | 131 | 37x4 | Left |
| Norwalk, F | Touring, 6 | 1,875 | 6 | 29.45 | 131 | 37x4 | Left |
| Oakland, 49 | Touring, 7 | 1,685 | 6 | 29.45 | 123 | 35x4 | Left |
| Oldsmobile, 42 | Roadster, 2 | 1,285 | 4 | 19.61 | 112 | 33x4 | Left |
| Oldsmobile, 42 | Touring, 5 | 1,285 | 4 | 19.61 | 112 | 33x4 | Left |
| Overland, 80 | Coupe, 4 | 1,600 | 4 | 27.20 | 114 | 35x4 | Left |
| Overland, 82 | Touring, 7 | 1,475 | 6 | 29.45 | 125 | 35x4 | Left |
| Paige, 6 | Roadster, 3 | 1,395 | 6 | 29.45 | 124 | 34x4 | Left |
| Paige, 6 | Touring, 7 | 1,395 | 6 | 29.45 | 124 | 34x4 | Left |
| Patersen, 6-48 | Touring, 5 | 1,495 | 6 | 29.45 | 124 | 34x4 | Left |
| Pilot, 55 | Roadster, 2 | 1,885 | 6 | 29.45 | 126 | 34x4 | Left |
| Pilot, 55 | Touring, 5 | 1,885 | 6 | 29.45 | 126 | 34x4 | Left |
| Pilot, 55 | Touring, 7 | 1,985 | 6 | 29.45 | 126 | 34x4 | Left |
| Pratt, 4-40 | Roadster, 2 | 1,850 | 4 | 27.20 | 122 | 34x4 | Left |
| Pratt, 4-40 | Touring, 4 | 1,850 | 4 | 27.20 | 122 | 34x4 | Left |
| Pratt, 4-40 | Touring, 5 | 1,850 | 4 | 27.20 | 122 | 34x4 | Left |
| Spaulding, H | Touring, 5 | 1,680 | 4 | 29.00 | 120 | 36x4 | Left |
| Spaulding, H | Sleeper, 5 | 1,730 | 4 | 29.00 | 120 | 36x4 | Left |
| Stearns, 4 | Touring, 5 | 1,750 | 4 | 22.50 | 119 | 34x4 | Left |
| Studebaker, 6 | Touring, 5 | 1,385 | 6 | 29.45 | 121 | 34x4 | Left |
| Studebaker, 6 | Touring, 7 | 1,450 | 6 | 29.45 | 121 | 34x4 | Left |
| Stutz, H.C.S. | Roadster, 2 | 1,475 | 4 | 36.15 | 108 | 32x4 | Right |
| Velie, 4-45 | Roadster, 2 | 1,750 | 4 | 34.28 | 121 | 37x4 | Left |
| Velie, 4-45 | Touring, 4 | 1,750 | 4 | 34.28 | 121 | 37x4 | Left |
| Velie, 4-45 | Touring, 5 | 1,750 | 4 | 34.28 | 121 | 37x4 | Left |
| Velie, Biltwel | Roadster, 2 | 1,595 | 6 | 29.45 | 124 | 34x4 | Left |
| Velie, Biltwel | Touring, 5 | 1,595 | 6 | 29.45 | 124 | 34x4 | Left |
| Velie, Biltwel | Touring, 6 | 1,645 | 6 | 29.45 | 124 | 34x4 | Left |
| Velie, Biltwel | Convert'l, 2 | 1,850 | 6 | 29.45 | 124 | 34x4 | Left |
| Westcott, U | Roadster, 2 | ... | 6 | 29.45 | 125 | 35x4 | Left |
| Westcott, U | Touring, 6 | ... | 6 | 29.45 | 125 | 35x4 | Left |

*Rear tires only; front a size smaller. **2-door design.

Automobiles Listing from \$2,000 to \$2,999

WHILE there are only 75 per cent. as many makes in the \$2,500 class the purchaser still has a wide range to choose from.

There are forty-two makers listing fifty-four chassis upon which there are 126 different types of bodies. There are fewer changes to be noted in this class of cars than in any other, the size of the motor, the wheelbase and all the principal dimensions and practices of chassis work are the same. The price has varied so little that it can practically be said to be unchanged. Body refinements and better equipment, however, make the \$2,500 car of this year a better value than that of last. It is in this class that many have gone from the five- to the seven-passenger touring car without altering the price.

| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
|---------------------------|----------------------------------|-------|------------------|----------------|------------------|------------------|----------------------|
| Abbott-Detroit, L. | Touring, 7 | 2,085 | 4 | 32.40 | 121 | 36x4 | Right |
| Abbott-Detroit, F. | Roadster, 3 | 2,190 | 6 | 33.75 | 130 | 35x4 | Left |
| Abbott-Detroit, F. | Touring, 5 | 2,190 | 6 | 33.75 | 130 | 35x4 | Left |
| Abbott-Detroit, F. | Touring, 7 | 2,290 | 6 | 33.75 | 130 | 35x4 | Left |
| Apperson, 6-60 | Roadster, 2 | 2,200 | 6 | 40.80 | 122 | 36x4 | Left |
| Apperson, 6-60 | Touring, 5 | 2,200 | 6 | 40.80 | 128 | 36x4 | Left |
| Apperson, 6-60 | Touring, 7 | 2,350 | 6 | 40.80 | 134 | 37x4 | Left |
| Auburn, 6-47 | Roadster, 2 | 2,000 | 6 | 33.75 | 135 | 37x4 | Left |
| Auburn, 6-47 | Touring, 6 | 2,000 | 6 | 33.75 | 135 | 37x4 | Left |
| Cadillac, 51 | Land-Coupe, 3 | 2,500 | 8 | 31.28 | 122 | 36x4 | Left |
| Cadillac, 51 | Sedan, 5 | 2,800 | 8 | 31.28 | 122 | 36x4 | Left |
| Case, 40 | Touring, 7 | 2,000 | 4 | 32.40 | 124 | 37x4 | Right |
| Chalmers, 26 B. | Sedan, 5 | 2,750 | 6 | 29.45 | 125 | 34x4 | Left |
| Chalmers, Master 6 | Touring, 5 | 2,400 | 6 | 38.40 | 132 | 36x4 | Left |
| Chalmers, Master 6 | Touring, 7 | 2,400 | 6 | 38.40 | 132 | 36x4 | Left |
| Chandler, 15 | Sedan, 5 | 2,750 | 6 | 27.30 | 120 | 34x4 | Left |
| Cole, 6-50 | Coupe, 3 | 2,250 | 6 | 29.45 | 126 | 35x4 | Left |
| Crow-Elkhart, E-62 | Roadster, 2 | ... | 6 | 33.75 | 130 | 36x4 | Right |
| Crow-Elkhart, E-64 | Touring, 4 | ... | 6 | 33.75 | 130 | 36x4 | Right |
| Crow-Elkhart, E-65 | Touring, 5 | ... | 6 | 33.75 | 130 | 36x4 | Right |
| Crow-Elkhart, E-66 | Touring, 6 | ... | 6 | 33.75 | 130 | 36x4 | Right |
| Davis, 6-50 | Touring, 5 | 2,150 | 6 | 33.75 | 128 | 37x4 | Left |
| Davis, 6-50 | Touring, 6 | 2,185 | 6 | 33.75 | 128 | 37x4 | Left |
| Dorris, 1-A-4 | Touring, 5 | 2,200 | 4 | 30.65 | 121 | 36x4 | Left |
| Dorris, 1-A-4 | Touring, 7 | 2,250 | 4 | 30.65 | 121 | 36x4 | Left |
| Dorris, 1-A-4 | Sedan, 4 | 2,800 | 4 | 30.65 | 121 | 36x4 | Left |
| Firestone-Columbus, 98 E. | Touring, 5 | 2,500 | 6 | 40.80 | 132 | 36x4 | Left |
| Firestone-Columbus, 90 E. | Touring, 7 | 2,650 | 6 | 40.80 | 132 | 36x4 | Left |
| Franklin, 6-30 M. | Roadster, 3 | 2,150 | 6 | 31.57 | 120 | 34x4 | Left |
| Franklin, 6-30 M. | Touring, 5 | 2,150 | 6 | 31.57 | 120 | 34x4 | Left |
| Franklin, 6-30 M. | Coupe, 3 | 2,600 | 6 | 31.57 | 120 | 34x4 | Left |
| Great Western, B. | Roadster, 2 | 2,200 | 4 | 22.50 | 117 | 34x4 | Left |
| Great Western, B. | Touring, 4 | 2,250 | 4 | 22.50 | 117 | 34x4 | Left |
| Great Western, B. | Touring, 6 | 2,500 | 4 | 22.50 | 117 | 34x4 | Left |
| Haynes, 32 | Coupe, 4 | 2,500 | 4 | 29.00 | 118 | 34x4 | Left |
| Haynes, 31 | Touring, 4 | 2,250 | 6 | 43.50 | 130 | 36x4 | Left |
| Haynes, 31 | Touring, 5 | 2,250 | 6 | 43.50 | 130 | 36x4 | Left |
| Hudson, 6-40 | Coupe, 4 | 2,150 | 6 | 29.45 | 123 | 34x4 | Left |
| Hudson, 6-40 | Limousine, 6 | 2,550 | 6 | 29.45 | 123 | 34x4 | Left |
| Hudson, 6-40 | Landaulet, 6 | 2,700 | 6 | 29.45 | 123 | 34x4 | Left |
| Hudson, 6-54 | Phaeton, 7 | 2,350 | 6 | 27.20 | 135 | 36x4 | Left |
| Imperial, 56 | Touring, 7 | 2,200 | 6 | 33.75 | 130 | 36x4 | Left |
| Jeffery, 4 | Sedan, 4 | 2,250 | 4 | 22.50 | 116 | 34x4 | Left |
| Jeffery, 4 | Limousine, 7 | 2,900 | 4 | 22.50 | 116 | 34x4 | Left |
| Jeffery, 6 | Touring, 7 | 2,400 | 6 | 33.75 | 133 | 34x4 | Left |
| Kissel, 6-48 | Touring, 5 | 2,350 | 4 | 25.60 | 132 | 36x4 | Left |
| Kissel, 6-48 | Touring, 7 | 2,350 | 4 | 25.60 | 132 | 36x4 | Left |
| Kissel, 6-48 | Roadster, 2 | 2,350 | 4 | 25.60 | 132 | 36x4 | Left |
| Kissel, 6-48 | Touring, 5** | 2,350 | 4 | 25.60 | 132 | 36x4 | Left |
| Kissel, 6-48 | Sedan, 5 | 2,700 | 4 | 25.60 | 132 | 36x4 | Left |
| Kissel, 6-48 | Cabriolet, 2 | 2,650 | 4 | 25.60 | 132 | 36x4 | Left |
| Kline, 6-42 A. | Limousine, 7 | 2,850 | 6 | 29.45 | 127 | 35x4 | Left |
| Lenox, 4 | Touring, 5 | 2,000 | 4 | 29.00 | 118 | 34x4 | Left |
| Lenox, 6 | Touring, 5 | 2,465 | 6 | 33.75 | 130 | 34x4 | Left |
| Lexington, 6-L | Sedan, 6 | 2,750 | 6 | 29.45 | 128 | 34x4 | Left |
| Lexington, 6-M | Touring, 5 | 2,575 | 6 | 40.80 | 130 | 36x4 | Left |
| Lexington, 6-M | Roadster, 3 | 2,575 | 6 | 40.80 | 130 | 36x4 | Left |
| Lexington, 6-M | Touring, 7 | 2,675 | 6 | 40.80 | 130 | 36x4 | Left |
| Louverne, 7-60 | Touring, 7 | 2,500 | 6 | 38.40 | 128 | 36x4 | Left |
| Lyons-Knight | Touring, 5 | 2,900 | 4 | 32.40 | 130 | 37x5 | Left |
| Lyons-Knight | Touring, 7 | 2,980 | 4 | 32.40 | 130 | 37x5 | Left |
| McFarlan, T. | Roadster, 2 | 2,590 | 6 | 38.40 | 132 | 36x4 | Left |
| McFarlan, T. | Touring, 4 | 2,590 | 6 | 38.40 | 132 | 36x4 | Left |
| McFarlan, T. | Touring, 5 | 2,590 | 6 | 38.40 | 132 | 36x4 | Left |
| McFarlan, T. | Touring, 6 | 2,590 | 6 | 38.40 | 132 | 36x4 | Left |
| McFarlan, T. | Touring, 7 | 2,590 | 6 | 38.40 | 132 | 36x4 | Left |
| McFarlan, X. | Roadster, 2 | 2,900 | 6 | 48.60 | 132 | 36x4 | Left |
| McFarlan, X. | Touring, 4 | 2,900 | 6 | 48.60 | 132 | 36x4 | Left |
| McFarlan, X. | Touring, 5 | 2,900 | 6 | 48.60 | 132 | 36x4 | Left |
| McFarlan, X. | Touring, 6 | 2,900 | 6 | 48.60 | 132 | 36x4 | Left |
| McFarlan, X. | Touring, 7 | 2,900 | 6 | 48.60 | 132 | 36x4 | Left |
| Mitchell, 7-6 | Touring, 7 | 2,350 | 6 | 43.50 | 144 | 37x5 | Left |
| Moline-Knight | Touring, 7 | 2,500 | 4 | 25.60 | 128 | 36x4 | Left |
| Moline-Knight | Roadster, 2 | 2,500 | 4 | 25.60 | 128 | 36x4 | Left |
| National, AA. | Roadster, 2 | 2,375 | 6 | 33.75 | 124 | 36x4 | Left |
| National, AA. | Toy-Tonneau, 4 | 2,375 | 6 | 33.75 | 132 | 36x4 | Left |
| National, AA. | Touring, 5 | 2,375 | 6 | 33.75 | 132 | 36x4 | Left |
| National, AA. | Touring, 6 | 2,500 | 6 | 33.75 | 132 | 36x4 | Left |
| National, AA. | Coupe, 4 | 2,850 | 6 | 33.75 | 132 | 36x4 | Left |
| National, AA. | Cabriolet, 3 | 2,700 | 6 | 33.75 | 132 | 36x4 | Left |
| National, AA. | Parlor Car, 4 | 2,700 | 6 | 33.75 | 132 | 36x4 | Left |
| Oldsmobile, 55 | Touring, 7 | 2,975 | 6 | 43.50 | 139 | 36x5 | Left |
| Pathfinder | Roadster, 4 | 2,222 | 6 | 33.75 | 125 | 34x4 | Left |
| Pathfinder | Touring, 7 | 2,322 | 6 | 33.75 | 125 | 34x4 | Left |
| Peerless, 54 | Roadster, 3 | 2,000 | 4 | 22.50 | 113 | 34x4 | Left |
| Peerless, 54 | Touring, 5 | 2,000 | 4 | 22.50 | 113 | 34x4 | Left |
| Peerless, 54 | Cabriolet, 3 | 2,300 | 4 | 22.50 | 113 | 34x4 | Left |
| Peerless, 55 | Roadster, 3 | 2,250 | 6 | 29.45 | 121 | 34x4 | Left |
| Peerless, 55 | Touring, 5 | 2,250 | 6 | 29.45 | 121 | 34x4 | Left |
| Peerless, 55 | Cabriolet, 3 | 2,250 | 6 | 29.45 | 121 | 34x4 | Left |
| Pilot, 75 | Speedster, 2 | 2,885 | 6 | 48.60 | 132 | 37x4 | Opt. |
| Pilot, 75 | Roadster, 2 | 2,885 | 6 | 48.60 | 132 | 37x4 | Opt. |
| Pilot, 75 | Touring, 5 | 2,885 | 6 | 48.60 | 132 | 37x4 | Opt. |
| Pilot, 75 | Touring, 7 | 2,885 | 6 | 48.60 | 132 | 37x4 | Opt. |
| Pratt, 6-50 | Roadster, 2 | 2,150 | 6 | 22.50 | 113 | 36x4 | Left |
| Pratt, 6-50 | Touring, 4 | 2,150 | 6 | 22.50 | 113 | 36x4 | Left |
| Pratt, 6-50 | Touring, 5 | 2,150 | 6 | 22.50 | 113 | 36x4 | Left |
| Pratt, 6-50 | Touring, 7 | 2,250 | 6 | 22.50 | 113 | 36x4 | Left |
| Premier-Weidely, A. | Roadster, 2 | 2,700 | 6 | 21.57 | 132 | 36x4 | Left |
| Premier-Weidely, A. | Touring, 5 | 2,700 | 6 | 21.57 | 132 | 36x4 | Left |
| Premier-Weidely, A. | Touring, 7 | 2,750 | 6 | 21.57 | 132 | 36x4 | Left |
| Pullman, 6-48 | Roadster, 2 | 2,500 | 6 | 33.75 | 134 | 36x4 | Left |
| Pullman, 6-48 | Touring, 5 | 2,500 | 6 | 33.75 | 134 | 36x4 | Left |
| Pullman, 6-48 | Touring, 7 | 2,550 | 6 | 33.75 | 134 | 36x4 | Left |
| Pullman, 6-48 | Cabriolet, 4 | 2,800 | 6 | 33.75 | 134 | 36x4 | Left |
| Singer, 6 | Roadster, 3 | 2,350 | 6 | 38.40 | 135 | 36x4 | Left |
| Singer, 6 | Touring, 5 | 2,350 | 6 | 38.40 | 135 | 36x4 | Left |
| Speedwell, 1 | Touring, 7 | 2,950 | 6 | 40.80 | 135 | 37x5 | Left |
| Stearns, 4 | Cabriolet, 2 | 2,250 | 4 | 22.50 | 119 | 34x4 | Left |
| Stearns, 4 | Limousine, 7 | 2,850 | 4 | 22.50 | 119 | 34x4 | Left |
| Stutz, Bearcat | Roadster, 2 | 2,000 | 4 | 36.15 | 120 | 34x4 | Right |
| Stutz, Roadster | Roadster, 2 | 2,000 | 4 | 36.15 | 120 | 34x4 | Right |
| Stutz, Bulldog | Speedster, 4 | 2,250 | 4 | 36.15 | 120 | 34x4 | Right |
| Stutz, Bearcat | Roadster, 2 | 2,125 | 6 | 38.40 | 120 | 34x4 | Right |
| Stutz, Roadster | Roadster, 2 | 2,125 | 6 | 38.40 | 120 | 34x4 | Right |
| Stutz, Touring | Touring, 6 | 2,400 | 6 | 38.40 | 120 | 34x4 | Right |
| Stutz, Touring | Touring, 6 | 2,275 | 4 | 36.15 | 120 | 34x4 | Right |
| Velie, 12 | Sedan, 5 | 2,450 | 4 | 34.28 | 121 | 37x4 | Left |
| Velie, 14 | Roadster, 2 | 2,015 | 6 | 29.45 | 126 | 37x4 | Left |
| Velie, 14 | Torpedo, 4 | 2,015 | 6 | 29.45 | 126 | 37x4 | Left |
| Velie, 14 | Touring, 5 | 2,015 | 6 | 29.45 | 126 | 37x4 | Left |
| Velie, 14 | Sedan, 5 | 2,715 | 6 | 29.45 | 126 | 37x4 | Left |
| White, 30 | Roadster, 2 | 2,700 | 4 | 22.50 | 115 | 32x4 | Left |
| White, 30 | Touring, 5 | 2,700 | 4 | 22.50 | 115 | 32x4 | Left |
| Willys-Knight | Roadster, 2 | 2,750 | 4 | 25.60 | 120 | 36x4 | Left |
| Willys-Knight | Touring, 5 | 2,750 | 4 | 25.60 | 120 | 36x4 | Left |

*Rear tires only; front a size smaller.

Tables a Guide to Purchaser

ALTOGETHER this season, there are 119 makers listed in the annual tables. Many of these are selling cars that fall into different price classifications, but a small majority are found in the two lower-priced classes. In cars selling up to \$2,000, there are 100 makers, fifty making cars selling below \$1,250 and fifty from \$1,250 to \$1,999. There are forty-two manufacturers of cars selling between \$2,000 and \$2,999 and thirty-four selling above \$3,000.

Out of 535 American cars, 187 are priced at more than \$3,000; 126 between \$2,000 and \$2,999; 122 between \$1,250 and \$1,999 and 100 at less than \$1,250. Thus we find that the makers of the high-priced cars offer their purchasers a larger choice of bodies than do the low-priced and intermediate manufacturers. Out of the chassis offered this season there are forty-eight carrying bodies priced above \$3,000, fifty-four carrying cars between \$2,000 and \$2,999; sixty-three between \$1,250 and \$1,999 and fifty-seven below \$1,250.

Closed Body Developments

The tendency of the makers of higher-priced cars to offer more bodies, than those of lower-priced vehicles is due to the use of the inclosed body on the higher-priced car. Those who go into the inclosed coachwork at all generally find it more profitable to manufacture three or four types of inclosed bodies rather than to bend their efforts solely towards one. While the limousine, in the first few years of inclosed body design, was supreme, its claim for first place is being challenged by the sedan and landaulet.

In the tables given on these pages the purchaser is fully informed regarding the style of body and seating capacity which the various makers are producing. The price is also given together with some of the leading specifications.

About one-quarter of the manufacturers of cars listing above \$3,000 have dropped from the ranks. We miss this year such familiar names as those of Lozier, Knox, and others. But few have come to take the place of those who have dropped out. The new maker in this day of the light low-priced four and six hardly ventures to tempt fate by entering the lists with a high-priced car. On the other hand there is a steady demand for stable cars which have gained a reputation for themselves and which sell around the \$4,000 mark.

While there are but thirty-four makers whose cars are listed above \$3,000 more than 187 stock jobs are manufactured. The large number of cars in proportion to manufacturers is due to the practice on the part of several large makers to list a large number of inclosed bodies. As a mat-

ter of fact the list does not show the entire gamut of the high priced cars open to the purchaser. The Pierce-Arrow company, for example, lists fifty-four body styles as stock. This does not mean that these bodies are on chassis awaiting shipment on order, but it means that the patterns, drawings, etc., have been completed and are in the company's shop ready for use on order.

What is true of the Pierce company can doubtless be said of Packard, Peerless and other makers of high-priced chassis. These concerns have made but few mechanical changes during the year. Refinements in appearance which cannot be brought out by figures are universal throughout and withal there has been a price reduction of \$140 on the average. The average car in this classification for 1915 sells for \$4,563 whereas in 1914 it sold for \$4,700. An increase of 1 inch in the average wheelbase has also been made and while it is not such a great percentage of length increase as to be of premier importance it shows that the trend inaugurated in 1911 and followed consistently ever since has not as yet passed this climax. The figure for average wheelbase is now 133.2 inches. The rise started in 1911 when it was 124 inches, jumping 5 inches in 1912, 1 inch in 1913, 2 in 1914 and now an additional inch for this season.

Many Roadsters and Touring Cars

While the greater percentage of bodies selling in the \$4,000 class are the inclosed limousines, landaulets and coupés, a large percentage of the total are roadsters and touring cars. The Simplex company and the new F. R. P. are offering their cars in this class in chassis form, special bodies being put on to order.

Of the concerns selling cars in this price class only eight are listing but one chassis. The remaining twenty-six list from two to three. There are none who list more than this number. The concerns which only list one chassis are Austin, Cunningham, Porter, Morse, Owen, Republic, S. G. V. and Winton. Those who list three chassis are Peerless, Pierce-Arrow and White. There is only one concern making the high-priced car which lists only a touring body—this is the Republic. Nevertheless touring bodies are not slighted. Five manufacturers are listing those of four-passenger capacity, twelve of five-passenger capacity, five of six-passenger and eighteen of seven-passenger capacity. The most popular class of body among the \$4,000 cars is the limousine. The landaulets and sedans run a close race for second choice in closed bodies being respectively 12 and 11 in number. In addition, six makers are offering coupés and six berlines.

Automobiles Listing Above \$3,000

| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
|----------------|----------------------------------|---------|------------------|----------------|------------------|------------------|----------------------|
| Austin, 66 | Roadster, 2 | \$3,600 | 6 | 48.60 | 141 | 34x4 | Left |
| Austin, 66 | Close Cpld, 4 | 3,600 | 6 | 48.60 | 141 | 34x4 | Left |
| Austin, 66 | Touring, 6 | 3,600 | 6 | 48.60 | 141 | 34x4 | Left |
| Austin, 66 | Touring, 7 | 3,600 | 6 | 48.60 | 141 | 34x4 | Left |
| Austin, 66 | Inclosed, 5 | 4,200 | 6 | 48.60 | 141 | 34x4 | Left |
| Austin, 66 | Limousine, 7 | 4,700 | 6 | 48.60 | 141 | 34x4 | Left |
| Cadillac, 51 | Limousine, 7 | 3,450 | 8 | 31.28 | 122 | 36x4 | Left |
| Cadillac, 51 | Berline, 7 | 3,600 | 8 | 31.28 | 122 | 36x4 | Left |
| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
| Chadwick, 19 | Roadster, 2 | \$5,500 | 6 | 60.00 | 112 | 37x5 | Right |
| Chadwick, 19 | Touring, 5 | 5,500 | 6 | 60.00 | 133 | 37x5 | Right |
| Chadwick, 19 | Touring, 7 | 5,500 | 6 | 60.00 | 133 | 37x5 | Right |
| Chadwick, 19 | Limousine, 7 | 6,500 | 6 | 60.00 | 133 | 37x5 | Right |
| Chalmers, 26-B | Limousine, 7 | 3,200 | 6 | 29.45 | 125 | 34x4 | Left |
| Cole, 6 | Coupe, 4 | 3,000 | 6 | 43.80 | 136 | 36x4 | Left |

*Rear tires only; front a size smaller.

Automobiles Listing Above \$3,000—Cont'd

| NAME AND MODEL | Body, Style and Seating Capacity | Price | No. of Cylinders | S. A. E. H. P. | Wheelbase Inches | Tire Size Inches | Location of Steering |
|----------------------|----------------------------------|---------|------------------|----------------|------------------|------------------|----------------------|
| Cunningham, S. | Touring, 7 | 3,750 | 4 | 36.15 | 129 | 37x5 | Left |
| Cunningham, S. | Limousine, 7 | 5,000 | 4 | 36.15 | 129 | 37x5 | Left |
| Cunningham, S. | Landulet, 7 | 5,000 | 4 | 36.15 | 129 | 37x5 | Left |
| Dorris, I-A-4 | Limousine, 7 | 3,400 | 4 | 30.54 | 121 | 36x4 | Left |
| Fiat, 55 | Roadster, 2 | 4,650 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Roadster, 3 | 4,650 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Touring, 5 | 4,650 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Touring, 7 | 4,650 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Limousine, 7 | 5,650 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Landulet, 7 | 5,750 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 55 | Berline, 7 | 5,950 | 4 | 42.20 | 128 | 37x5 | Right |
| Fiat, 59 | Roadster, 2 | 5,150 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Touring, 5 | 5,150 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Touring, 7 | 5,150 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Roadster, 3 | 5,150 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Limousine, 7 | 6,150 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Landulet, 7 | 6,250 | 6 | 46.00 | 135 | 37x5 | Right |
| Fiat, 59 | Berline, 7 | 6,450 | 6 | 46.00 | 135 | 37x5 | Right |
| Franklin | Sedan, 5 | 3,000 | 6 | 31.57 | 120 | 34x4 | Left |
| Franklin | Berline, 6 | 3,200 | 6 | 31.57 | 120 | 34x4 | Left |
| F. R. P., 45 B | Chassis | 5,000 | 4 | 32.40 | 110-140 | 36x5 | Right |
| Great Western, B | Coupe, 2 | 3,800 | 4 | 22.50 | 117 | 34x4 | Left |
| Great Western, B | Sedan, 4 | 4,000 | 4 | 22.50 | 117 | 34x4 | Left |
| Great Western, B | Limousine, 6 | 4,800 | 4 | 22.50 | 117 | 34x4 | Left |
| Haynes, 31 | Coupe, 4 | 3,000 | 6 | 43.50 | 130 | 36x4 | Left |
| Hudson, 6-54 | Sedan, 5 | 3,100 | 6 | 40.80 | 135 | 36x4 | Left |
| Hudson, 6-54 | Limousine, 7 | 3,500 | 6 | 40.80 | 135 | 36x4 | Left |
| Kissel, 6-60 | Roadster, 2 | 3,150 | 6 | 48.60 | 142 | 37x5 | Left |
| Kissel, 6-60 | Touring, 7 | 3,150 | 6 | 48.60 | 142 | 37x5 | Left |
| Kissel, 6-60 | Limousine, 7 | 4,900 | 6 | 48.60 | 142 | 37x5 | Left |
| Lexington, 6-M | Limousine, 7 | 3,550 | 6 | 40.80 | 130 | 36x4 | Left |
| Locomobile, M-5 | Roadster, 2 | 5,100 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, M-5 | Touring, 6 | 5,100 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, M-5 | Touring, 7 | 5,100 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, M-5 | Limousine, 7 | 6,200 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, M-5 | Landulet, 7 | 6,300 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, M-5 | Berline, 7 | 6,500 | 6 | 48.60 | 140 | 37x5 | Left |
| Locomobile, R-4 | Roadster, 2 | 4,400 | 6 | 43.50 | 132 | 37x5 | Left |
| Locomobile, R-4 | Touring, 5 | 4,400 | 6 | 43.50 | 132 | 37x5 | Left |
| Locomobile, R-4 | Touring, 4 | 4,400 | 6 | 43.50 | 132 | 37x5 | Left |
| Locomobile, R-4 | Limousine, 7 | 5,400 | 6 | 43.50 | 132 | 37x5 | Left |
| Locomobile, R-4 | Landulet, 7 | 5,500 | 6 | 43.50 | 132 | 37x5 | Left |
| Locomobile, R-4 | Berline, 7 | 5,700 | 6 | 43.50 | 132 | 37x5 | Left |
| Lyons-Knight | Sedan, 5 | 3,900 | 4 | 32.40 | 130 | 37x5 | Left |
| Lyons-Knight | Limousine, 7 | 4,300 | 4 | 32.40 | 130 | 37x5 | Left |
| Marmion, 41 | Speedster, 2 | 3,250 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Roadster, 2 | 3,250 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Touring, 4 | 3,250 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Touring, 5 | 3,250 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Touring, 7 | 3,350 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Limousine, 7 | 4,750 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Landulet, 7 | 5,250 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 41 | Landulet, 7 | 5,350 | 6 | 43.50 | 132 | 36x4 | Left |
| Marmion, 48 | Touring, 7 | 5,000 | 6 | 48.60 | 145 | 37x5 | Left |
| Moline-Knight | Sedan, 5 | 3,250 | 4 | 25.60 | 128 | 36x4 | Left |
| Moline-Knight | Limousine, 7 | 3,800 | 4 | 25.60 | 128 | 36x4 | Left |
| Morse, D | Roadster, 2-3 | 3,600 | 4 | 34.28 | 127 | 36x4 | Right |
| Morse, D | Touring, 5 | 3,600 | 4 | 34.28 | 127 | 36x4 | Right |
| Morse, D | Touring, 7 | 3,600 | 4 | 34.28 | 127 | 36x4 | Right |
| R. M. Owen | Roadster, 3 | 3,500 | 6 | 31.57 | 136 | 35x5 | Left |
| R. M. Owen | Touring, 7 | 3,500 | 6 | 31.57 | 136 | 35x5 | Left |
| Packard, 3-38 | Roadster, 2 | 3,750 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Touring, 6 | 3,350 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Salon Tour, 6 | 3,850 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Touring, 7 | 3,850 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Phaeton, 5 | 3,750 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Limousine, 7 | 5,000 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Limousine, 7 | 4,950 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Limousine, 6 | 4,950 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Limousine, 6 | 4,900 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Coupe, 3 | 4,450 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Landulet, 7 | 5,000 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Landulet, 7 | 4,950 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Landulet, 6 | 4,900 | 6 | 38.40 | 140 | 37x5 | Left |
| Packard, 3-38 | Roadster, 2 | 4,750 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Touring, 7 | 4,850 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Touring, 6 | 4,850 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Phaeton, 5 | 4,750 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Limousine, 7 | 5,950 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Limousine, 6 | 5,900 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Coupe, 5 | 5,450 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Landulet, 7 | 6,000 | 6 | 48.60 | 144 | 37x5 | Left |
| Packard, 3-38 | Brougham, 6 | 6,000 | 6 | 48.60 | 144 | 37x5 | Left |
| Peerless, 54 | Sedan, 5 | 3,100 | 4 | 22.50 | 113 | 34x4 | Left |
| Peerless, 54 | Limousine, 7 | 3,100 | 4 | 22.50 | 113 | 34x4 | Left |
| Peerless, 55 | Sedan, 5 | 3,350 | 6 | 29.45 | 121 | 34x4 | Left |
| Peerless, 55 | Limousine, 7 | 3,350 | 6 | 29.45 | 121 | 34x4 | Left |
| Peerless, 55 | Roadster, 3 | 4,900 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Peerless, 48 | Touring, 7 | 5,000 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Peerless, 48 | Limousine, 7 | 6,000 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Peerless, 48 | Sedan, 5 | 5,900 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Peerless, 48 | Landulet, 7 | 6,100 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Peerless, 48 | Berline, 7 | 6,200 | 6 | 48.60 | 137 | 37x5 | Opt. |
| Pierce-Arrow, 38 | Roadster, 3 | 4,300 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 38 | Touring, 5 | 4,300 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 38 | Touring, 4 | 4,300 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 38 | Coupe, 2 | 4,575 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 38 | Brougham, 7 | 5,200 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 38 | Landulet, 7 | 5,350 | 6 | 38.40 | 134 | 36x4 | Right |
| Pierce-Arrow, 48 | Roadster, 3 | 4,900 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 48 | Touring, 5 | 4,900 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 48 | Touring, 4 | 4,900 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 48 | Coupe, 2 | 5,175 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 48 | Touring, 7 | 5,000 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 48 | Landulet, 7 | 5,000 | 6 | 48.60 | 142 | 37x5 | Right |
| Pierce-Arrow, 66 | Roadster, 3 | 5,900 | 6 | 60.00 | 147 | 38x5 | Right |
| Pierce-Arrow, 66 | Touring, 5 | 5,900 | 6 | 60.00 | 147 | 38x5 | Right |
| Pierce-Arrow, 66 | Touring, 4 | 5,900 | 6 | 60.00 | 147 | 38x5 | Right |
| Pierce-Arrow, 66 | Touring, 7 | 6,000 | 6 | 60.00 | 147 | 38x5 | Right |
| Pierce-Arrow, 66 | Coupe, 2 | 6,175 | 6 | 60.00 | 147 | 38x5 | Right |
| Pierce-Arrow, 66 | Landulet, 7 | 7,000 | 6 | 60.00 | 147 | 38x5 | Right |
| Pullman, 6-48 | Sedan, 4 | 3,200 | 6 | 33.75 | 134 | 36x4 | Left |
| Pullman, 6-48 | Limousine | 3,500 | 6 | 33.75 | 134 | 37x4 | Left |
| Republic, E | Touring, 4 | 3,000 | 6 | 29.00 | 133 | 36x4 | Left |
| Republic, E | Touring, 5 | 3,000 | 6 | 29.00 | 133 | 36x4 | Left |
| Republic, E | Touring, 7 | 3,000 | 6 | 29.00 | 133 | 36x4 | Left |
| S. G. V., J | Roadster, 2 | 3,300 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Touring, 5 | 3,300 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Limousine, 6 | 4,000 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Brougham, 6 | 4,000 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Landulet, 6 | 4,000 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Sedan, 4 | 4,000 | 4 | 24.22 | 118 | 34x4 | Left |
| S. G. V., J | Landulet, 6 | 4,300 | 4 | 24.22 | 118 | 34x4 | Left |
| Simplex, 38 | Chassis | 4,000 | 4 | 38.25 | 137 | 37x5 | Right |
| Simplex, 50 | Chassis | 4,500 | 4 | 46.34 | 137 | 37x5 | Right |
| Stearns, Big 4 | Roadster, 3 | 3,750 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Touring, 4 | 3,750 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Touring, 5 | 3,750 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Touring, 6 | 3,900 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Touring, 7 | 3,900 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Limousine, 7 | 5,000 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, Big 4 | Landulet, 7 | 5,100 | 4 | 29.00 | 121 | 36x4 | Left |
| Stearns, 6 | Roadster, 3 | 4,850 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Touring, 4 | 4,850 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Touring, 5 | 4,850 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Touring, 6 | 5,000 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Touring, 7 | 5,000 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Limousine, 7 | 6,100 | 6 | 43.50 | 140 | 37x5 | Left |
| Stearns, 6 | Landulet, 7 | 6,200 | 6 | 43.50 | 140 | 37x5 | Left |
| Stevens-Duryea, D-6 | Roadster, 3 | 4,550 | 6 | 30.65 | 131 | 37x4 | Left |
| Stevens-Duryea, D-6 | Touring, 5 | 4,550 | 6 | 30.65 | 131 | 37x4 | Left |
| Stevens-Duryea, D-6 | Demi-Berline, 5 | 5,750 | 6 | 30.65 | 131 | 37x4 | Left |
| Stevens-Duryea, D-4 | Phaeton, 5 | 5,400 | 6 | 30.65 | 131 | 37x4 | Left |
| Stevens-Duryea, D-4 | Limousine, 7 | 5,800 | 6 | 30.65 | 131 | 37x4 | Left |
| Stevens-Duryea, DD-6 | Touring, 7 | 4,800 | 6 | 28.37 | 138 | 37x5 | Left |
| Stevens-Duryea, DD-6 | Phaeton, 7 | 5,600 | 6 | 28.37 | 138 | 37x5 | Left |
| Stevens-Duryea, DD-6 | Limousine, 7 | 6,100 | 6 | 28.37 | 138 | 37x5 | Left |
| Stevens-Duryea, DD-6 | Berline, 7 | 6,200 | 6 | 28.37 | 138 | 37x5 | Left |
| Stevens-Duryea, DD-6 | Landulet, 7 | 6,300 | 6 | 28.37 | 138 | 37x5 | Left |
| Stutz | Sedan, 6 | 3,800 | 6 | 38.40 | 120 | 34x4 | Right |
| Stutz | Sedan, 6 | 3,675 | 4 | 36.15 | 130 | 34x4 | Right |
| Touraine, 12 | Roadster, 2 | 3,150 | 6 | 38.40 | 124 | 34x4 | Left |
| Touraine, 12 | Touring, 5 | 3,150 | 6 | 38.40 | 124 | 34x4 | Left |
| Touraine, 12 | Coupe, 2 | 4,050 | 6 | 38.40 | 124 | 34x4 | Left |
| Touraine, 12 | Touring, 7 | 3,250 | 6 | 38.40 | 134 | 34x4 | Left |
| Touraine, 12 | Limousine, 7 | 4,550 | 6 | 38.40 | 134 | 34x4 | Left |
| White, 39 | Town car, 5 | 4,000 | 4 | 22.50 | 115 | 32x4 | Left |
| White, 39 | Sedan, 5 | 4,000 | 4 | 22.50 | 115 | 32x4 | Left |
| White, 45 | Touring, 7 | 3,800</ | | | | | |

Passenger Cars for 1915 Listed

ANNUALLY THE AUTOMOBILE publishes its table of specifications of American cars to serve as a reference during the year. The information given on these tables is taken from data sheets filled out by the respective manufacturers. This is gathered together up to the last possible moment and finally tabulated in the form below. Many of the manufacturers wait until this season of the year to make their first announcement of new models at the January show in New York. Their designs are kept secret and not shown until the exhibition.

Many of these models are described in this table but others do not appear and in a number of instances descriptions are given of the new cars in the review of the industry given on pages 1228 to 1260 of this issue.

In connection with the tables under price classifications, page 1215, the information in these pages offers a complete guide to the purchaser or student of the development of the automobile industry. In this tabulation, the cards of the manufacturer are laid upon the table and the practices which he believes are submitted to the scrutiny of those who are interested in the purchase or development of an automobile.

How to use the tables depends on the purpose of the user. For the purchaser the recommended method is to first turn to the pages of the buyers' guide, page 1215. Here will be

found the names of the cars selling at the price it is intended to pay. The body styles and the principal questions of power and equipment will be answered. After the cars that meet the requirements of the buyer are selected from the buyers' guide, the table of specifications herewith answer the questions that the motorwise buyer will ask before making up his mind what car he desires.

The table follows a logical order through the chassis. First the number of cylinders is given and this season the choice of a four, six or eight will be found listed. The power of the motor is the next consideration and this is given completely by not only furnishing the bore and stroke but by giving the S. A. E. formula rating. As this formula is apt to hit under rather than over the power developed by the modern motor, the piston displacement is given in addition to complete the information.

Complete Story of the Motor

As well as a table can accomplish it the complete story of the motor is told by the details furnished on the shape of the cylinders. Whether they are L-head, with valves all on one side, T-head with valves on opposite sides or I-head carrying the valves in the head is part of the data supplied. The exact location of the valves is further told by a column devoted

| MAKE AND MODEL | No. of Cylinders | Bore and Stroke, Inches | S. A. E. H. P. | Piston Displacement, Cubic Inches | CYLINDERS | | Valve Location | Camshaft Drive | Cooling Circulation | LUBRICATION | | IGNITION | | | CARBURETION | | | CRANKING SYSTEM | |
|-------------------------|------------------|-------------------------|----------------|-----------------------------------|-----------|----------|----------------|----------------|---------------------|-------------|--------------|----------|--------------|---------|--------------------|-----------|-------------------------|-----------------|--------------|
| | | | | | Shape | How Cast | | | | System | Type of Pump | System | Make | Control | Make of Carburetor | Fuel Feed | Is Hot Air Pipe Fitted? | Type | Make |
| A | | | | | | | | | | | | | | | | | | | |
| Abbott-Detroit, 34-40 K | 4 | 4.125x5.250 | 27.25 | 280.6 | L-Head.. | Block. | Left.. | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Splitdorf... | Hand. | Zenith... | Gravity. | Yes.... | Elec. | Auto-lite... |
| Abbott-Detroit, 44-50 L | 4 | 4.500x5.500 | 32.40 | 349.9 | L-Head.. | Pairs.. | Left.. | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Splitdorf... | Hand. | Zenith... | Gravity. | Yes.... | Elec. | Auto-lite... |
| Abbott-Detroit, 50-60 F | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head.. | Three.. | Right. | Hel'l.. | Pump... | Splash... | Gear... | Single. | Bosch.... | Hand. | Zenith... | Pres.... | Yes.... | Elec. | Auto-lite... |
| Allen, 34 | 4 | 3.625x5.000 | 20.25 | 206.4 | L-Head.. | Block. | Right. | Hel'l.. | Thermo. | Splash... | Piston... | Single. | Wathse... | Hand. | Schebler... | Gravity. | Yes.... | Elec. | Wathse.... |
| Apperson, 4-40 | 4 | 4.000x5.000 | 25.60 | 251.3 | L-Head.. | Block. | Right. | Spur.. | Pump... | Pres.... | Gear... | Single. | Eisemann... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Bijur.... |
| Apperson, 6-45 | 6 | 3.500x5.125 | 29.45 | 295.9 | L-Head.. | Block. | Right. | Spur.. | Pump... | Pres.... | Gear... | Single. | Eisemann... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Bijur.... |
| Apperson, 6-60 | 6 | 4.125x5.000 | 40.80 | 400.4 | T-Head.. | Block. | Opp... | Spur.. | Pump... | Pres.... | Gear... | Single. | Eisemann... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Bijur.... |
| Apperson, 6-60 | 6 | 4.125x5.000 | 40.80 | 400.9 | T-Head.. | Block. | Opp... | Spur.. | Pump... | Pres.... | Gear... | Single. | Eisemann... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Bijur.... |
| Apperson, 6-60 | 6 | 4.125x5.000 | 40.80 | 400.9 | T-Head.. | Block. | Opp... | Spur.. | Pump... | Pres.... | Gear... | Single. | Eisemann... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Bijur.... |
| Arbuz | 4 | 4.125x5.250 | 27.25 | 280.6 | L-Head.. | Pairs.. | Right. | Hel'l.. | Pump... | Pres.... | Gear... | Single. | At Kent... | Auto. | Schebler... | Gravity. | Yes.... | Elec. | Diehl.... |
| Argo | 4 | 2.317x4.000 | 8.54 | 67.1 | L-Head.. | Block. | Right. | Spur.. | Thermo. | Splash... | Piston... | Single. | At Kent... | Hand. | ..... | Gravity. | No.... | ..... | ..... |
| Auburn, 4-36 | 4 | 3.750x5.000 | 22.50 | 220.9 | T-Head.. | Block. | Opp... | Hel'l.. | Pump... | Splash... | Central.. | Single. | ..... | Auto. | Rayfield... | Vacuum. | Yes.... | Elec. | ..... |
| Auburn, 6-40 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block. | Right. | Hel'l.. | Pump... | Spl-Pre.. | Piston... | Single. | ..... | H & A. | Rayfield... | Vacuum. | Yes.... | Elec. | ..... |
| Auburn, 6-47 | 6 | 3.750x5.250 | 33.75 | 347.9 | L-Head.. | Pairs.. | Left.. | Hel'l.. | Pump... | Spl-Pre.. | Central.. | Single. | Bosch.... | H & A. | Rayfield... | Pres.... | Yes.... | Elec. | ..... |
| Austin, 66 | 6 | 4.500x6.000 | 48.60 | 572.5 | T-Head.. | Block. | Opp... | Hel'l.. | Pump... | Splash... | None.... | Dual.. | Wathse... | H & A. | Master... | Vacuum. | Yes.... | Elec. | Wathse... |
| B | | | | | | | | | | | | | | | | | | | |
| Bauer, 30 | 4 | 3.750x5.000 | 22.50 | 294.5 | L-Head.. | Block. | Right. | Spur.. | Pump... | Spl-Pre.. | Piston... | Single. | Mea.... | Hand. | Schebler... | Gravity. | Yes.... | Elec. | Emerson... |
| Briscoe | 4 | 3.125x5.125 | 15.64 | 157.2 | L-Head.. | Block. | Right. | Chain. | Thermo. | Splash... | Piston... | Single. | Splitdorf... | Foot.. | ..... | Gravity. | No.... | Elec. | Apleo.... |
| Buick, C-24, C-25 | 4 | 3.750x3.750 | 22.50 | 165.6 | I-Head.. | Pairs.. | Head.. | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Delco.... | Hand. | Marvel... | Gravity. | Yes.... | Elec. | Delco.... |
| Buick, C-36, C-37 | 4 | 3.750x5.000 | 22.50 | 220.9 | I-Head.. | Pairs.. | Head.. | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Delco.... | Auto. | Marvel... | Vacuum. | Yes.... | Elec. | Delco.... |
| Buick, C-54, C-55 | 6 | 3.750x5.000 | 33.75 | 331.4 | I-Head.. | Pairs.. | Head.. | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Delco.... | Auto. | Marvel... | Vacuum. | Yes.... | Elec. | Delco.... |
| C | | | | | | | | | | | | | | | | | | | |
| Cadillac | 8 | 3.125x5.125 | 31.28 | 314.6 | L-Head.. | Fours. | L&R.. | Chain. | Pump... | Spl-Pre.. | Gear... | Dual.. | Delco.... | H & A. | Own.... | Pres.... | No.... | Elec. | Delco.... |
| Cartercar | 4 | 3.500x5.000 | 19.61 | 192.4 | L-Head.. | Block. | Left.. | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Delco.... | Hand. | Schebler... | Pres.... | Yes.... | Elec. | Delco.... |
| Case, 25 | 4 | 3.750x4.750 | 22.50 | 314.6 | T-Head.. | Pairs.. | Opp... | Hel'l.. | Pump... | Splash... | Piston... | Single. | Wathse... | H & A. | Stromberg. | Gravity. | Yes.... | Elec. | Wathse... |
| Case, 35 | 4 | 4.250x5.500 | 28.90 | 312.0 | T-Head.. | Pairs.. | Opp... | Hel'l.. | Pump... | Splash... | Gear... | Dual.. | Bosch.... | Hand. | Rayfield... | Gravity. | Yes.... | Elec. | Wathse... |
| Case, 40 | 4 | 4.500x5.250 | 32.40 | 334.0 | T-Head.. | Pairs.. | Opp... | Hel'l.. | Pump... | Splash... | Gear... | 2-Pt.. | Bosch.... | Hand. | Rayfield... | Pres.... | Yes.... | Elec. | Wathse... |
| Chadwick, 19 | 6 | 5.000x6.000 | 60.00 | 721.0 | L-Head.. | Pairs.. | S & H. | Hel'l.. | Pump... | Pres.... | Piston... | Doub. | Bosch.... | Hand. | Own.... | Pres.... | Yes.... | Elec. | Wathse... |
| Chadwick, 19 | 6 | 5.000x6.000 | 60.00 | 721.0 | L-Head.. | Pairs.. | S & H. | Hel'l.. | Pump... | Pres.... | Piston... | Doub. | Bosch.... | Hand. | Own.... | Pres.... | Yes.... | Elec. | Wathse... |
| Chalmers, 26-B | 6 | 3.500x5.500 | 29.45 | 317.5 | T-Head.. | Block. | Opp... | Hel'l.. | Thermo. | Spl-Pre.. | Gear... | Single. | At Kent... | H & A. | Rayfield... | Gravity. | Yes.... | Elec. | Entz.... |
| Chalmers, Master 6 | 6 | 4.000x5.500 | 38.40 | 414.7 | T-Head.. | Block. | Opp... | Hel'l.. | Thermo. | Splash... | Gear... | Single. | Bosch.... | Hand. | Rayfield... | Pres-Gr. | Yes.... | Elec. | Entz.... |
| Chandler, 15 | 6 | 3.375x5.000 | 33.75 | 331.4 | L-Head.. | Three.. | Right. | Chain. | Pump... | Spl-Pre.. | Gear... | Single. | Bosch.... | Hand. | Rayfield... | Pres.... | Yes.... | Elec. | G & D.... |

ABBREVIATIONS:—Valve Location: Side and head, S & H.; Left and right, L & R. Camshaft Drive: Helical gears, Hel'l.; Spur gears, Spur. Cooling Circulation: Thermo-siphon, Thermo. Lubrication System: Splash and pressure, Spl-Pre.; Pressure, Pres. Type of Pump: Flywheel, Flywhl.; Rotary, Rot.; Centrifugal, Cent. Ignition System: Double, Doub.; Two-point, 2-Pt. Ignition Make: Westinghouse, Wathse; Atwater Kent, At Kent; Connecticut, Conn. Ignition Control: Automatic, Auto.; Hand and automatic, H & A.; Hand or fixed, H or F. Make of Carburetor: Optional, Opt. Fuel Feed: Pressure-gravity, Pres-Gr. Type of Cranking System: Electric, Elec.; Electric and air, E. & Air. *60-inch tread optional. **Tread more or less than standard except Scripps-Booth, which is optional.

with Their Principal Specifications

specifically to that purpose. Another shows camshaft drive.

The systems of the car are next considered. These are the means for cooling, lubrication, ignition, carburetion, cranking, lighting and transmission.

The systems used for cooling the car are divided into three classes: those in which the water circulation is accomplished by thermo-syphon, those in which a pump is used and motors cooled by air. In describing the method of lubrication, the motor alone is referred to. Where all the bearings are taken care of by the oil that is splashed up by the connecting-rods, the system is known as the splash. Where the oil is forced by pressure to all the bearing surfaces, generally by way of the main bearings and thence through the hollow crankshaft to the connecting-rod lower ends after which it passes through a lead to the wristpin, the system is known as pressure feed. In the splash-pressure system a combination of the two methods is used. The oil is generally fed to the main bearings under pressure and thence flows into the splash troughs allowing the splash of the connecting rods to take care of the lubrication of the other bearings.

Under ignition, the type of the system is mentioned together with the make of the distributing or generating apparatus. The control of the spark whether it is fixed, hand or automatic, is stated. Describing carburetion the table

mentions the make of the carburetor and the means for feeding the fuel. The question of whether or not a hot air pipe is fitted in order to aid in the best possible evaporation of the fuel is also answered. The name of the maker of the lighting and starting systems is furnished.

The Transmission System

In taking up the transmission system the drive is traced from the motor to the rear axle. The first unit, the clutch, is divided into the broad classifications of disk, cone or band. The type of gearset and its location together with the number of forward speeds gives full information on this point. The rear system is described giving the type of final drive, whether it is through bevel gears, spiral-bevel or worm, how the propulsive thrusts of the rear wheels are delivered and the design of the rear axle stating whether floating or otherwise. The information on the drive of the car is completed by stating the gear ratio and by furnishing a description of the running gear, stating the wheelbase, tire size and material from which the wheels are made.

The remainder of the table is devoted to information on the rear spring suspension, location of the drive and control members and a description of the type of bearings used for the crankshaft, gearset, rear axle and front wheels.

| Lighting System | TRANSMISSION | | | | | | | | RUNNING GEAR | | | | CONTROL | | BEARINGS | | | | MAKE AND MODEL | |
|-----------------|--------------|---------|----------|---------------|-------------|--------------------|-----------|----------------------------|--------------|-------|------|--------|--------------|-------------------------|--------------------|-------------------------|---------|-----------|----------------|-------------------------|
| | Clutch Type | GEARSET | | | Final Drive | Car Drives Through | Rear Axle | Total Gear Ratio on Direct | Wheel-base | TIRES | | Wheels | Rear Springs | Location Steering Wheel | Gearshift Location | Crankshaft Type and No. | Gearset | Rear Axle | | Front Wheel |
| | | Type | Location | Forward Sp'ds | | | | | | Front | Rear | | | | | | | | | |
| Auto-lite | Diak | Sel | Unit M. | 3 | Bevel | Rad Rd | Float | 3.75-1 | 116 | 34x4 | 34x4 | Wood | Ell | Right | Right | Plain, 3. | Roll | B&R | Roll | Abbott-Detroit, 34-40 K |
| Auto-lite | Diak | Sel | Unit M. | 3 | Bevel | Rad Rd | Float | 3.50-1 | 121 | 36x4 | 36x4 | Wood | Ell | Right | Right | Plain, 3. | Roll | B&R | Roll | Abbott-Detroit, 44-50 L |
| Auto-lite | Diak | Sel | Unit M. | 4 | Bevel | Tor T | Float | 4.00-1 | 130 | 35x4 | 35x4 | Wood | Ell | Left | Cent. | Plain, 3. | Roll | B&R | Roll | Abbott-Detroit, 50-60 F |
| Waltham | Cone | Sel | Unit M. | 3 | Bevel | Springs | Semi F | 4.00-1 | 110 | 32x3 | 32x3 | Wood | Ell | Left | Cent. | Plain, 2. | Ball | Roll | Ball | Allen, 34 |
| Bijur | Con Bd | Sel | Amid | 3 | Bevel | Springs | Float | | 116 | 34x4 | 34x4 | Wood | Ell | Left | Cent. | Plain, 3. | | | | Apperson, 4-40 |
| Bijur | Con Bd | Sel | Amid | 3 | Bevel | Springs | Float | | 126 | 34x4 | 34x4 | Wood | Ell | Left | Cent. | Plain, 4. | | | | Apperson, 6-45 |
| Bijur | Con Bd | Sel | Amid | 3 | Bevel | Springs | Float | | 122 | 36x4 | 36x4 | Wood | Ell | Left | Cent. | Plain, 4. | | | | Apperson, 6-60 |
| Bijur | Con Bd | Sel | Amid | 3 | Bevel | Springs | Float | | 128 | 36x4 | 36x4 | Wood | Ell | Left | Cent. | Plain, 4. | | | | Apperson, 6-60 |
| Bijur | Con Bd | Sel | Amid | 3 | Bevel | Springs | Float | | 134 | 37x4 | 37x4 | Wood | Ell | Left | Cent. | Plain, 4. | | | | Apperson, 6-60 |
| Wells | Cone | Sel | Rear A. | 3 | Bevel | Rad Rd | Float | 3.75-1 | 120 | 36x4 | 36x4 | Wood | Semi E | Opt | Cent. | Plain, 3. | Roll | Roll | Ball | Arbens |
| At Kent | Cone | Prog | Amid | 2 | Bevel | Tor T | Semi F | 4.25-1 | 90 | 28x2 | 28x2 | Wire | Ell | Left | Cent. | Plain, 2. | Plain | Ball | Ball | Argo |
| | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.08-1 | 114 | 32x4 | 32x4 | Wood | Ell | Left | Cent. | Plain, 3. | B&R | Roll | Ball | Auburn, 4-36 |
| | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.00-1 | 126 | 34x4 | 34x4 | Wood | Ell | Left | Cent. | | B&R | Ball | Ball | Auburn, 6-40 |
| | Cone | Sel | Amid | 3 | Bevel | Springs | Float | 4.50-1 | 135 | 37x4 | 37x4 | Wood | Ell | Left | Cent. | | | Ball | Ball | Auburn, 6-47 |
| Waltham | Diak | Sel | Amid | 3 | Bevel | Springs | Float | 3.00-1 | 141 | 34x4 | 34x4 | Wood | Cant. | Left | Cent. | Plain, 4. | Ball | Ball | Ball | Austin, 66 |
| Emerson | Diak | Sel | Unit M. | 3 | Bevel | Rad Rd | Float | 4.00-1 | 110 | 34x3 | 34x3 | Wood | Ell | Left | Cent. | Plain, 2. | Ball | Roll | Ball | Bauer, 30 |
| Apleo | Cone | Sel | Unit M. | 3 | Bevel | Tor T | Float | 4.00-1 | 107* | 30x3 | 30x3 | Opt | S-E | Opt | Cent. | Plain, 2. | Pl&B. | B&R | Ball | Briscoe |
| Deleo | Cone | Sel | Amid | 3 | Bevel | Tor Rd | Float | 106* | 32x3 | 32x3 | Wood | Ell | Left | Cent. | Plain, 3. | Ball | B&R | Ball | Ball | Buick, C-24, C-25 |
| Deleo | Cone | Sel | Amid | 3 | Bevel | Tor Rd | Float | 3.50-1 | 112* | 34x4 | 34x4 | Wood | Ell | Left | Cent. | Plain, 3. | Ball | B&R | Ball | Buick, C-36, C-37 |
| Deleo | Cone | Sel | Amid | 3 | Bevel | Tor Rd | Float | 3.75-1 | 130 | 36x4 | 36x4 | Wood | Cant. | Left | Cent. | Plain, 4. | Ball | Ball | Ball | Buick, C-54, C-55 |
| Deleo | Diak | Sel | Unit M. | 3 | Sp. B. | Springs | Float | 4.42-1 | 122* | 36x4 | 36x4 | Wood | Plat | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Cadillac |
| Deleo | | Fric | Amid | | Chain | Rad Rd | Float | 4.00-1 | 106 | 33x4 | 33x4 | Wood | Ell | Right | Right | Plain, 3. | Ball | B&R | Ball | Cartercar |
| Waltham | Diak | Sel | Unit M. | 3 | Bevel | Tor T | Float | 4.00-1 | 115* | 34x4 | 34x4 | Wood | Cant. | Left | Cent. | Plain, 3. | Roll | Ball | Roll | Case, 25 |
| Waltham | Diak | Sel | Unit M. | 3 | Bevel | Springs | Float | 3.58-1 | 120* | 35x4 | 35x4 | Wood | Ell | Left | Cent. | Plain, 3. | Roll | B&R | Ball | Case, 35 |
| Waltham | Diak | Sel | Amid | 3 | Bevel | Springs | Float | | 124* | 37x4 | 37x4 | Wood | Ell | Right | Right | Plain, 3. | Roll | Roll | Roll | Case, 40 |
| Waltham | Band | Sel | Amid | 4 | Chain | Rad Rd | Dead | 2.25-1 | 133 | 36x4 | 37x5 | Wood | Plat | Right | Right | Plain, 4. | Ball | Ball | Ball | Chadwick, 19 |
| Waltham | Band | Sel | Amid | 4 | Chain | Rad Rd | Dead | 2.25-1 | 112 | 36x4 | 37x5 | Wood | Plat | Right | Right | Plain, 4. | Ball | Ball | Ball | Chadwick, 19 |
| Entz | Disk | Sel | Rear A. | 3 | Bevel | Tor T | Float | 4.00-1 | 125 | 34x4 | 34x4 | Wood | Ell | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Chalmers, 26-B |
| Entz | Disk | Sel | Unit M. | 4 | Bevel | Tor T | Float | 4.00-1 | 132 | 36x4 | 36x4 | Wood | Ell | Left | Cent. | Plain, 3. | Roll | Roll | Ball | Chalmers, Master 6 |
| G & D | Disk | Sel | Unit M. | 3 | Bevel | Tor Rd | Float | 4.00-1 | 120 | 34x4 | 34x4 | Wood | Ell | Left | Cent. | Plain, 3. | Ball | Ball | Roll | Chandler, 15 |

ABBREVIATIONS:—Make of Cranking System: North East, North-E.; Gray & Davis, G. & D.; Ward Leonard, Ward L.; Bosch-Rushmore, Bosch-R.; Allis-Chalmers, Allis-C.; Leeco-Neville, Leeco-Nev.; Splitdorf-Apple, Splidf-Ap.; Entz-Dyneto, Entz-Dyn.; Robbins & Meyers, Rob-Myr.; Hendricks, Hendrix. Clutch Type: Contracting band, Con Bd.; Expanding band, Exp Bd. Gearset Type: Selective, Sel.; Progressive, Prog.; Frictional, Fric.; Planetary, Plan. Gearset Location: Unit with motor, Unit M.; Amidships, Amid.; Rear Axle, Rear A. Final Drive: Spiral bevel, Sp Bev. Car Drives Through: Radius rod, Rad Rd.; Torsion tube, Tor T.; Torsion arm, Tor A. Rear Axle: Floating, Float.; Semi-floating, Semi F.; Elliptic, Ell.; Non-floating, Non-Float. Rear Springs: Elliptic, Ell.; Elliptic, Ell.; Cantilever, Cant.; Semi-elliptic, Semi E.; Platform, Plat. Control: Center, Cent. Bearings: Roller, Roll.; Ball and roller, B&R.; Plain and ball, Pl&B.; Plain and roller, Pl&R.

Passenger Cars for 1915 Listed with Th

| MAKE AND MODEL | No. of Cylinders | Bore and Stroke, Inches | S. A. E. H. P. | Piston Displacement Cubic Inches | CYLINDERS | | Valve Location | Camshaft Drive | Cooling Circulation | LUBRICATION | | IGNITION | | | CARBURETION | | | CRANKING SYSTEM | |
|-------------------------------|------------------|-------------------------|----------------|----------------------------------|-----------|----------|----------------|----------------|---------------------|-------------|--------------|----------|--------------|---------|--------------------|-----------|-------------------------|-----------------|-----------|
| | | | | | Shape | How Cast | | | | System | Type of Pump | System | Make | Control | Make of Carburetor | Fuel Feed | Is Hot Air Pipe Fitted? | Type | Make |
| Chevrolet, Baby Grand | 4 | 3.687x4.000 | 21.38 | 170.9 | I-Head.. | Block | Head.. | Hel'l. | Thermo. | Splash | Gear... | Single | Simms | Hand | Zenith | Vacuum | Yes | Elec | Auto-lite |
| Chevrolet, Royal Mail | 4 | 3.687x4.000 | 21.38 | 170.9 | I-Head.. | Block | Head.. | Hel'l. | Thermo. | Splash | Gear... | Single | Simms | Hand | Zenith | Gravity | Yes | Elec | Auto-lite |
| Cole, 4-40 | 4 | 4.250x5.250 | 28.90 | 297.8 | L-Head.. | Pairs.. | Left.. | Hel'l. | Pump... | Splash | Vacuum | Dual.. | Delco | Hand | Stromberg | Vacuum | Yes | Elec | Delco |
| Cole, 6 | 6 | 4.250x5.250 | 43.80 | 446.7 | L-Head.. | Pairs.. | Left.. | Hel'l. | Pump... | Splash | Vacuum | Dual.. | Delco | Hand | Stromberg | Pres | Yes | Elec | Delco |
| Cole, 6-50 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block | Left.. | Hel'l. | Pump... | Splash | Vacuum | Dual.. | Delco | Hand | Stromberg | Vacuum | Yes | Elec | Delco |
| Corbitt, F. & E. | 4 | 4.000x4.500 | 25.60 | 226.2 | L-Head.. | Pairs.. | Left.. | Spur. | Pump | Splash | Centra'l | Single | At Kent... | Hand | Stromberg | Gravity | No | Elec | Jones |
| Crawford, 6-35 | 6 | 3.500x5.000 | 29.45 | 288.6 | L-Head.. | Block | Right | Hel'l. | Pump | Splash | Piston... | Single | Wathse... | H & A | Stromberg | Vacuum | Yes | Elec | Wathse |
| Crow-Elkhart, E42, E45 | 4 | 4.000x5.000 | 25.60 | 251.3 | L-Head.. | Pairs.. | Left.. | Hel'l. | Thermo | Splash | Gear... | Dual.. | Remy... | Hand | Schebler... | Gravity | Yes | Elec | Emerson |
| Crow-Elkhart, E52, 54, 55, 56 | 4 | 4.250x5.500 | 28.90 | 312.0 | L-Head.. | Block | Right | Hel'l. | Thermo | Splash | Gear... | Dual.. | Sevison... | Hand | Schebler... | Gravity | Yes | Elec | Emerson |
| Crow-Elkhart, E62, 64, 65, 66 | 6 | 3.750x5.500 | 33.75 | 364.4 | L-Head.. | Block | Right | Hel'l. | Pump | Splash | Gear... | Dual.. | Sevison... | Hand | Schebler... | Gravity | Yes | Elec | Emerson |
| Cunningham, S. | 4 | 4.750x5.750 | 36.10 | 407.6 | I-Head.. | Pairs.. | Head | Hel'l. | Pump | Pres | Gear... | Dual.. | Undec... | Hand | Stromberg | Pres... | Yes | Elec | |
| Cycleplane-Tourist | 4 | 2.500x4.000 | 10.00 | 100.6 | L-Head.. | Block | Left.. | Gear | Thermo | Spl-Pre... | Piston... | Single | Optional... | Auto. | Own | Gravity | Yes | None | |
| Cycleplane-Traveler | 2 | 3.375x4.000 | 18.21 | 71.5 | L-Head.. | Singly | | L & H | Thermo | Spl-Pre... | Piston... | Single | At Kent... | Auto. | Schebler | Gravity | Yes | None | |
| D | | | | | | | | | | | | | | | | | | | |
| Davis, 38-A, 38-B | 4 | 3.750x5.000 | 22.50 | 220.9 | L-Head.. | Block | Right | Hel'l. | Thermo | Splash | Piston... | Single | Wathse... | Hand | Stromberg | Gravity | Yes | Elec | Wathse |
| Davis, 6-50 | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head.. | Threes | Right | Hel'l. | Pump... | Splash | Gear... | Dup | Bosch | Hand | Stromberg | Pres... | Yes | Elec | G. & D. |
| Detroit, C. | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head.. | Block | Right | Hel'l. | Thermo | Splash | Flwhl | Single | Wathse... | H & A | Stromberg | Gravity | Yes | Elec | Wathse |
| Dile, A. | 4 | 2.625x4.000 | 11.23 | 86.6 | L-Head.. | Block | Right | Spur. | Thermo | Spl-Pre... | Piston... | Single | Berling... | Fixed | Holley | Gravity | No | | |
| Dodge | 4 | 3.875x4.500 | 24.22 | 198.8 | L-Head.. | Block | Right | Hel'l. | Pump... | Splash | Eccen... | Single | Eisemann... | Hand | Own | Pres... | Yes | Elec | N. E. |
| Dorris, 1-A-4 | 4 | 4.375x5.000 | 30.62 | 300.7 | I-Head.. | Pairs.. | Head | Hel'l. | Pump... | Splash | Gear... | Dual.. | Wathse... | H & A | Stromberg | Vacuum | No | Elec | Wathse |
| E | | | | | | | | | | | | | | | | | | | |
| Empire, 34-40 | 4 | 3.750x4.500 | 22.50 | 198.8 | L-Head.. | Pairs.. | Left.. | Chain | Thermo | Splash | Piston... | Single | Eisemann... | H or F | Holley | Gravity | Yes | Elec | Remy |
| Enger, Six-50 | 6 | 3.500x5.000 | 29.45 | 288.6 | L-Head.. | Block | Right | Hel'l. | Pump... | Spl-Pre... | Piston... | Single | At Kent... | Auto. | Rayfield... | Gravity | Yes | Elec | G. & D. |
| F | | | | | | | | | | | | | | | | | | | |
| Fiat, 55 | 4 | 5.118x6.692 | 42.00 | 557.0 | L-Head.. | Block | Left.. | Hel'l. | Pump... | Pres | Gear... | Dual.. | Bosch | Hand | Own | Pres | No | Elec | Bosch-R. |
| Fiat, 50 | 6 | 4.330x5.905 | 45.00 | 529.9 | L-Head.. | Block | Left.. | Hel'l. | Pump... | Pres | Gear... | Dual.. | Bosch | Hand | Own | Pres | No | Elec | Bosch-R. |
| Firestone-Col., 82-E, 86-E | 4 | 4.125x5.250 | 27.25 | 280.6 | L-Head.. | Block | Left.. | Hel'l. | Pump... | Spl-Pre... | Gear... | Dual.. | Splitdorf... | Hand | Schebler | Gravity | No | Elec | G. & D. |
| Firestone-Col., 90-E, 98-E | 6 | 4.125x5.250 | 40.90 | 420.9 | L-Head.. | Threes | Left.. | Hel'l. | Pump... | Spl-Pre... | Gear... | Doub | Conn | Hand | Rayfield... | Gravity | Yes | Elec | G. & D. |
| Ford, T. | 4 | 3.750x4.000 | 22.50 | 176.7 | L-Head.. | Block | Right | Spur. | Thermo | Splash | Flwhl | Single | Own | Hand | Holley | Gravity | Yes | None | |
| Franklin, 6-30 | 6 | 3.625x4.000 | 31.60 | 247.7 | I-Head.. | Singly | Head | Hel'l. | Air | Spl-Pre... | Gear... | Single | Eisemann... | Auto. | Own | Gravity | Yes | Elec | Dyneto |
| F. R. P., 45-B | 4 | 4.600x6.750 | 34.28 | 453.6 | I-Head.. | Block | Head | Worm | Pump... | Spl-Pre... | Rotary | 2-Pt | Bosch | Hand | Stewart | Pres | No | Elec | Bosch |
| G | | | | | | | | | | | | | | | | | | | |
| Glide, 30 | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head.. | Block | Right | Hel'l. | Thermo | Splash | Piston... | Single | Wathse... | H & A | Schebler | Gravity | Yes | Elec | Wathse |
| Grant, M | 4 | 2.750x4.000 | 12.10 | 95.0 | L-Head.. | Block | Left.. | Hel'l. | Thermo | Splash | Vacuum | Single | Swiss | Hand | Mayer | Gravity | Yes | Elec | Allis-C. |
| Grant, T. | 6 | 2.875x4.250 | 20.00 | 165.5 | I-Head.. | Block | Head | Hel'l. | Thermo | Spl-Pre... | Gear... | Single | At Kent... | Auto. | Undec | Gravity | Yes | Elec | Undec |
| Great Western, A | 4 | 4.250x5.500 | 28.90 | 312.0 | L-Head.. | Singly | Right | Hel'l. | Pump | Spl-Pre... | Piston... | Single | Kingston | Hand | Kingston | Gravity | Yes | Elec | G. & D. |
| Great Western, B | 4 | 3.750x5.750 | 22.50 | 254.0 | I-Head.. | Block | Head | Hel'l. | Pump | Spl-Pre... | Cent... | Single | Kingston | Hand | Kingston | Gravity | Yes | Elec | Bosch-R. |
| H | | | | | | | | | | | | | | | | | | | |
| Haynes, 32 | 4 | 4.250x5.500 | 28.90 | 312.0 | L-Head.. | Pairs.. | Right | Hel'l. | Pump... | Splash | Piston... | Dual.. | Simms | Hand | Stromberg | Pres | Yes | Elec | Leece-Ne. |
| Haynes, 30 | 6 | 3.500x5.000 | 29.45 | 288.6 | L-Head.. | Block | Right | Hel'l. | Pump... | Splash | Piston... | Dual.. | Remy | Hand | Rayfield... | Vacuum | Yes | Elec | Leece-Ne. |
| Haynes, 31 | 6 | 4.250x5.500 | 43.80 | 468.0 | L-Head.. | Pairs.. | Right | Hel'l. | Pump... | Splash | Piston... | Dual.. | Simms | Hand | Stromberg | Pres | Yes | Elec | Leece-Ne. |
| Herfi-Brooks, 4-40 | 4 | 4.500x5.000 | 32.40 | 318.1 | L-Head.. | Singly | Left.. | Hel'l. | Pump... | Splash | Gear... | Single | Bosch | Hand | Stromberg | Gravity | Yes | Elec | Spidf-Ap. |
| Herfi-Brooks, 6-50 | 6 | 4.000x4.500 | 38.40 | 339.2 | L-Head.. | Singly | Left.. | Hel'l. | Pump... | Splash | Gear... | Single | Bosch | Hand | Stromberg | Gravity | Yes | Elec | Spidf-Ap. |
| Herreshoff, 4-16 | 4 | 2.375x3.250 | 8.77 | 57.8 | L-Head.. | Block | Right | Hel'l. | Thermo | Spl-Pre... | Piston... | Single | At Kent... | Auto. | Carter | Gravity | | Elec | Entz-Dyn. |
| Hudson, 6-40 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block | Right | Hel'l. | Pump... | Spl-Pre... | Piston... | Dual.. | Delco | H & A | Zenith | Gravity | Yes | Elec | Delco |
| Hudson, 6-54 | 6 | 4.125x5.250 | 40.90 | 420.9 | L-Head.. | Threes | Right | Hel'l. | Pump... | Spl-Pre... | Piston... | Dual.. | Delco | Hand | Zenith | Gravity | Yes | Elec | Delco |
| Hupmobile, H | 4 | 3.250x5.500 | 16.90 | 182.5 | L-Head.. | Block | Left.. | Chain | Thermo | Pres | Flwhl | Single | Bosch | Hand | Zenith | Gravity | Yes | Elec | Wathse |
| Hupmobile, K | 4 | 3.375x5.500 | 18.25 | 196.8 | L-Head.. | Block | Left.. | Chain | Thermo | Pres | Flwhl | Single | At Kent... | Auto | Zenith | Gravity | Yes | Elec | Wathse |
| I | | | | | | | | | | | | | | | | | | | |
| Imperial, 64 | 4 | 3.750x5.000 | 22.50 | 220.9 | L-Head.. | Block | Right | Hel'l. | Thermo | Splash | Piston... | Single | At Kent... | | Stromberg | Gravity | Yes | Elec | G. & D. |
| Imperial, 56 | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head.. | Threes | Right | Hel'l. | Pump... | Splash | Piston... | Dual.. | Splitdorf... | Hand | Stromberg | Vacuum | Yes | Elec | North-E. |
| Inter-state, 71 | 4 | 3.500x5.000 | 19.60 | 192.4 | I-Head.. | Block | Head | Hel'l. | Thermo | Splash | Gear... | Single | | Hand | | Gravity | Yes | Elec | |
| J | | | | | | | | | | | | | | | | | | | |
| Jackson-Olympic | 4 | 4.500x5.250 | 32.40 | 334.0 | L-Head.. | Pairs.. | Left.. | Hel'l. | Pump... | Splash | Piston... | Dual.. | Remy | Hand | Schebler | Gravity | Yes | Elec | Auto-lite |
| Jackson, 6-48 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block | Left.. | Hel'l. | Pump... | Splash | Piston... | Dual.. | Delco | H & A | Stromberg | Gravity | Yes | Elec | Delco |
| Jeffery, 4 | 4 | 3.750x5.250 | 22.50 | 231.9 | L-Head.. | Block | Right | Hel'l. | Pump... | Spl-Pre... | Piston... | Dup | Bosch | Hand | Rayfield... | Pres | Yes | Elec | U. S. L. |
| Jeffery, 6 | 6 | 3.750x5.250 | 33.75 | 347.0 | L-Head.. | Pairs.. | Left.. | Hel'l. | Pump... | Spl-Pre... | Piston... | Single | Bosch | Hand | Rayfield... | Vacuum | Yes | Elec | U. S. L. |
| Jeffery-Chesterfield | 6 | 3.000x5.000 | 21.60 | 212.0 | L-Head.. | Block | Right | Hel'l. | Pump... | Spl-Pre... | Cent | Single | Bosch | Hand | Rayfield... | Vacuum | Yes | Elec | Bijur |
| K | | | | | | | | | | | | | | | | | | | |
| Kearns | 4 | 2.875x4.000 | 13.37 | 106.1 | I-Head.. | Block | Head | Hel'l. | Thermo | Spl-Pre... | Piston... | Single | Berling... | Hand | Zenith | Gravity | Yes | Elec | Allis-C. |
| King, D | 8 | 2.750x5.000 | 24.16 | 380.1 | L-Head.. | Fours | L & R | Chain | Thermo | Spl-Pre... | Gear | Single | | H & A | | Yes | Elec | Ward-L. | |
| King | 4 | 3.937x5.000 | 24.98 | 243.5 | L-Head.. | Block | Left.. | Hel'l. | Thermo | Spl-Pre... | Flwhl | Single | At Kent... | H & A | Stromberg | Gravity | Yes | Elec | Ward-L. |
| Kissel, 4-36 | 4 | 4.250x5.500 | 29.00 | 312.0 | L-Head.. | Block | Right | Hel'l. | Pump... | Splash | Gear... | Single | Wathse... | Auto. | Stromberg | Vacuum | Yes | Elec | Own |

ABBREVIATIONS:—Valve Location: Side and head, S & H.; Left and right, L & R. Camshaft Drive: Helical gears, Hel'l.; Spur gears, Spur. Cooling Circulation: Thermo-siphon, Thermo. Lubrication System: Splash and pressure, Spl-Pre.; Pressure, Pres. Type of Pump: Flywheel, Flwhl.; Rotary, Rot.; Centrifugal, Cent. Ignition System: Double, Doub.; Two-point, 2-Pt. Ignition Make: Westinghouse, Wathse.; Atwater Kent, At Kent.; Connecticut, Conn. Ignition Control: Automatic, Auto.; Hand and automatic, H & A.; Hand or fixed, H or F. Make of Carburetor: Optional, Opt. Fuel Feed: Pressure-gravity, Pres-Gr. Type of Cranking System: Electric, Elec.; Electric and air, E. & Air. *60-inch tread optional. **Tread more or less than standard except Scripps-Booth, which is optional.

Principal Specifications—Continued

| Lighting System | TRANSMISSION | | | | | | | | RUNNING GEAR | | | | CONTROL | | | BEARINGS | | | | MAKE AND MODEL |
|-----------------|--------------|---------|----------|---------------|-------------|--------------------|-----------|----------------------------|--------------|-------|-------|--------|--------------|-------------------------|--------------------|-------------------------|---------|-----------|-------------|----------------------------------|
| | Clutch Type | GEARSET | | | Final Drive | Car Drives Through | Rear Axle | Total Gear Ratio on Direct | Wheel-base | TIRES | | Wheels | Rear Springs | Location Steering Wheel | Gearshift Location | Crankshaft Type and No. | Gearset | Rear Axle | Front Wheel | |
| | | Type | Location | Forward Sp'ds | | | | | | Front | Rear | | | | | | | | | |
| Auto-lite | Cone | Sel | Amid | 3 | Bevel | Tor Rd | Semi F | 4.00-1 | 106* | 32x34 | 32x34 | Wood | Ell | Left | Cent | Plain, 3 | Ball | B&R | Ball | Chevrolet, Baby Grand |
| Auto-lite | Cone | Sel | Amid | 3 | Bevel | Tor Rd | Semi F | 4.00-1 | 106* | 32x34 | 32x34 | Wood | Ell | Left | Cent | Plain, 3 | Ball | B&R | Ball | Chevrolet, Royal Mail |
| Delco | Cone | Sel | Unit M | 3 | Bevel | Springs | Semi F | 3.50-1 | 118* | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Roll | Cole, 4-40 |
| Delco | Cone | Sel | Unit M | 3 | Bevel | Springs | Float | 3.93-1 | 136 | 36x44 | 36x44 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Roll | Cole, 6 |
| Delco | Cone | Sel | Unit M | 3 | Bevel | Tor Rd | Float | 4.67-1 | 126* | 35x44 | 35x44 | Wood | S-E | Left | Cent | Plain, 4 | Ball | Roll | Roll | Cole, 6-50 |
| Jones | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 120 | 34x4 | 34x4 | Wood | Ell | Right | Cent | Plain, 3 | Ball | Ball | Ball | Corbitt, F. & E. |
| Wathse | Diak | Sel | Unit M | 3 | Sp Bev | Springs | Float | 3.90-1 | 120 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Roll | Roll | Roll | Crawford, 6-35 |
| Remy | Diak | Sel | Rear A | 3 | Bevel | Rad Rd | Float | 4.00-1 | 114 | 33x4 | 33x4 | Wood | Ell | Right | Cent | Plain, 3 | Plain | Roll | Ball | Crow-Elkhart, E42, E45 |
| Ward L | Diak | Sel | Rear A | 3 | Bevel | Rad Rd | Float | 4.00-1 | 120 | 34x4 | 34x4 | Wood | Ell | Right | Cent | Plain, 3 | Plain | Roll | Ball | Crow-Elkhart, E52, E54, E55, E56 |
| Ward L | Diak | Sel | Unit M | 3 | Bevel | Rad Rd | Float | 4.00-1 | 130 | 36x4 | 36x4 | Wood | Ell | Right | Cent | Plain, 4 | Plain | Roll | Ball | Crow-Elkhart, E62, E64, E65, E66 |
| | Diak | Sel | Unit M | 3 | Sp Bev | Springs | Float | 3.50-1 | 129 | 37x5 | 37x5 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Roll | Cunningham, S |
| | Diak | Sel | Unit M | 3 | Bevel | Rad Rd | Semi F | 3.00-1 | 108** | 28x3 | 28x3 | Wire | Ell | Left | Cent | Plain, 2 | Plain | B&R | Ball | Cycleplane-Tourist |
| | | Plan | Amid | 2 | Chain | Rad Rd | Live | 3.00-1 | 96** | 28x2 | 28x2 | Wire | S-E | Cent | Right | Roll | Plain | Ball | Ball | Cycleplane-Traveler |
| Wathse | Cone | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 112 | 34x4 | 34x4 | Wood | Plat | Left | Cent | Plain, 3 | B&R | Roll | Ball | Davis, 38-A, 38-B |
| G. & D. | Diak | Sel | Unit M | 4 | Bevel | Rad Rd | Float | 3.75-1 | 128 | 37x44 | 37x44 | Wood | Plat | Left | Cent | Plain, 3 | Ball | B&R | Ball | Davis, 6-50 |
| Wathse | Diak | Sel | Unit M | 3 | Bevel | Tor T | Float | 4.30-1 | 112 | 32x34 | 32x34 | Wood | Plat | Left | Cent | Ball, 2 | Ball | Ball | Ball | Detroit, C |
| Dyneto | Diak | Sel | Amid | 3 | Bevel | Springs | Semi F | 4.00-1 | 96** | 28x3 | 28x3 | Wire | Ell | Left | Cent | Plain, 3 | Ball | Ball | Ball | Dile, A |
| N. E. | Cone | Sel | Unit M | 3 | Bevel | Tor T | Float | 3.61-1 | 110* | 32x34 | 32x34 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Ball | Dodge |
| Wathse | Diak | Sel | Unit M | 3 | Sp Bev | Springs | Float | 4.08-1 | 121 | 36x44 | 36x44 | Wood | Plat | Left | Cent | Plain, 3 | Roll | Roll | Roll | Dorris, 1-A-4 |
| Remy | Diak | Sel | Unit M | 3 | Bevel | Springs | Semi F | 4.00-1 | 108 | 32x34 | 32x34 | Wood | Ell | Right | Cent | Plain, 3 | Ball | Roll | Ball | Empire, 34-40 |
| G. & D. | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 3.78-1 | 125 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Roll | B&R | Ball | Enger, Six-50 |
| Bosch-R. | Diak | Sel | Amid | 4 | Bevel | Tor T | Semi-F | | 128 | 36x44 | 37x5 | Opt | Ell | Right | Right | Plain, 3 | Ball | Ball | Ball | Fiat, 55 |
| Bosch-R. | Diak | Sel | Amid | 4 | Bevel | Tor T | Semi-F | | 135 | 36x44 | 37x5 | Opt | Ell | Right | Right | Plain, 4 | Ball | Ball | Ball | Fiat, 50 |
| G. & D. | Cone | Sel | Amid | 3 | Bevel | Tor T | Float | 3.50-1 | 116 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Ball | Ball | Firestone-Col., 82-E, 86-E |
| G. & D. | Diak | Sel | Unit M | 3 | Bevel | Tor T | Float | 3.50-1 | 132 | 36x4 | 36x44 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Ball | Ball | Firestone-Col., 90-E, 98-E |
| | Diak | Plan | Unit M | 2 | Bevel | Tor T | Semi-F | 3.63-1 | 100 | 30x3 | 30x34 | Wood | Cross | Left | Pedal | Plain, 3 | Plain | Roll | Ball | Ford, T |
| Dyneto | Diak | Sel | Amid | 3 | Sk Bev | Springs | Semi-F | 3.70-1 | 120 | 34x44 | 34x44 | Wood | Ell | Left | Cent | Plain, 7 | Ball | Roll | Roll | Franklin, 6-30 |
| Bosch | Cone | Sel | Amid | 4 | Bevel | Tor T | Float | Opt | Opt | 36x4 | 36x5 | Wire | S-E | Right | Right | Plain, 3 | Ball | Ball | Ball | F. R. P., 45-B |
| Wathse | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 114 | 32x4 | 32x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Ball | Ball | Glide, 30 |
| Al-Ch | Cone | Prog | Rear A | 2 | Bevel | Rad Rd | Float | 4.50-1 | 90 | 28x3 | 28x3 | Wire | Cross | Left | Cent | Plain, 2 | B&R | Roll | Ball | Grant, M |
| Undec | Cone | Sel | Unit M | 3 | Bevel | Rad Rd | Float | 4.00-1 | 106* | 30x3 | 30x34 | Wood | Cant | Left | Cent | Plain, 3 | B&R | B&R | Ball | Grant, T |
| G. & D. | Cone | Sel | Unit M | 3 | Bevel | Tor T | Float | 3.50-1 | 117 | 36x4 | 36x4 | Wood | Ell | Right | Right | Plain, 5 | Roll | B&R | Ball | Great Western, A |
| Bosch-R. | Cone | Sel | Unit M | 3 | Bevel | Tor T | Float | 4.00-1 | 117 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | B&R | Ball | Great Western, B |
| Leece-Nev | Con Bd | Sel | Unit M | 3 | Bevel | Springs | Float | 3.69-1 | 118 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Roll | Ball | Ball | Haynes, 32 |
| Leece-Nev | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 121 | 34x4 | 34x4 | Wood | S-E | Left | Cent | Plain, 3 | Ball | Ball | Ball | Haynes, 30 |
| Leece-Nev | Con Bd | Sel | Unit M | 3 | Bevel | Springs | Float | 3.66-1 | 130 | 36x44 | 36x44 | Wood | Ell | Left | Cent | Plain, 4 | Roll | Roll | Roll | Haynes, 31 |
| Spdlf-Ap | Cone | Elec | Amid | 3 | Bevel | Springs | Semi-F | 4.00-1 | 118 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 5 | B&R | Ball | Roll | Herf-Brooks, 4-40 |
| Spdlf-Ap | Cone | Elec | Amid | 3 | Bevel | Springs | Semi-F | 4.00-1 | 124 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 7 | B&R | Ball | Roll | Herf-Brooks, 6-50 |
| Dyneto | Cone | Sel | Amid | 3 | Bevel | Springs | Semi-F | 4.00-1 | 94** | 28x3 | 28x3 | Wire | Ell | Left | Cent | Ball | Ball | Ball | Ball | Herreshoff, 4-16 |
| Delco | Diak | Sel | Unit M | 3 | Sp Bev | Springs | Semi-F | 3.77-1 | 123 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Roll | Roll | Roll | Hudson, 6-40 |
| Delco | Diak | Sel | Unit M | 4 | Bevel | Springs | Float | 3.77-1 | 135** | 36x44 | 36x44 | Wood | Ell | Left | Cent | Plain, 3 | Roll | Roll | Roll | Hudson, 6-54 |
| Wathse | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 3.86-1 | 106* | 33x4 | 33x4 | Wood | Cross | Right | Cent | Plain, 3 | Roll | Roll | Roll | Hupmobile, H |
| Wathse | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 4.25-1 | 119* | 34x4 | 34x4 | Wood | S-E | Left | Cent | Plain, 3 | B&R | Ball | Roll | Hupmobile, K |
| G. & D. | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 115 | 32x34 | 32x34 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Ball | Imperial, 64 |
| North-E. | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 3.87-1 | 130 | 36x44 | 36x44 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Ball | Imperial, 56 |
| | Cone | Sel | Rear A | 3 | Bevel | Tor T | Float | 4.00-1 | 110 | 33x4 | 33x4 | Wood | Ell | Left | Cent | Plain, 3 | B&R | Roll | Ball | Inter-state, 71 |
| Auto-lite | Cone | Sel | Unit M | 3 | Bevel | Rad Rd | Float | 3.50-1 | 117 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Ball | Jackson-Olympic |
| Delco | Cone | Sel | Unit M | 3 | Bevel | Rad Rd | Float | 4.00-1 | 125 | 34x44 | 34x44 | Wood | Ell | Left | Cent | Plain, 4 | B&R | B&R | Ball | Jackson, 6-48 |
| U. S. L. | Cone | Sel | Amid | 4 | Bevel | Springs | Float | 4.07-1 | 116 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Ball | Roll | Jeffery, 4 |
| U. S. L. | Diak | Sel | Amid | 4 | Sp Bev | Springs | Float | 3.50-1 | 133 | 34x44 | 34x44 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Ball | Roll | Jeffery, 6 |
| Bijur | Diak | Sel | Amid | 4 | Worm | Springs | Float | 4.50-1 | 122 | 34x4 | 34x4 | Wood | Cant | Left | Cent | Plain, 3 | Ball | Ball | Roll | Jeffery-Chesterfield |
| Allis-C | Cone | Sel | Unit M | 3 | Bevel | Springs | Semi F | 4.00-1 | 100 | 28x3 | 28x3 | Wood | Ell | Opt | Cent | Plain, 2 | Ball | B&R | Ball | Kearns |
| Ward L | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | | 113 | 33x4 | 33x4 | Wood | Cant | Left | Cent | Plain, 3 | Roller | Ball | Ball | King, D |
| Ward L | Diak | Sel | Unit M | 3 | Bevel | Springs | Float | 3.70-1 | 113 | 33x4 | 33x4 | Wood | Cant | Left | Cent | Plain, 3 | Plain | Ball | Ball | King, D |
| Wathse | Cone | Sel | Unit M | 3 | Bevel | Springs | Float | 4.00-1 | 121 | 34x4 | 34x4 | Wood | Ell | Left | Cent | Plain, 3 | Ball | Roll | Roll | Kissel, 4-36 |

ABBREVIATIONS:—Make of Cranking System: North East, North-E.; Gray & Davis, G. & D.; Ward Leonard, Ward L.; Bosch-Rushmore, Bosch-R.; Allis-Chalmers, Allis-C.; Leeco-Neville, Leeco-Nev.; Spltdorf-Apple, Spldf-Ap.; Entz-Dyneto, Entz-Dyn.; Robbins & Meyers, Rob-Myr.; Hendricks, Hendrix. Clutch Type: Contracting band, Con Bd.; Expanding band, Exp Bd. Gearset Type: Selective, Sel.; Progressive, Prog.; Frictional, Fric.; Planetary, Plan. Gearset Location: Unit with motor, Unit M.; Amidships, Amid.; Rear Axle, Rear A. Final Drive: Spiral bevel, Sp Bev. Car Drives Through: Radius rod, Rad Rd.; Torsion tube, Tor T.; Torsion arm, Tor A. Rear Axle: Floating, Float.; Semi-floating, Semi F.; Float., Float.; Non-floating, Non-Float. Rear Springs: Elliptic, Ell. Elliptic, Ell.; Cantilever, Cant.; Semi-elliptic, Semi E.; Platform, Plat.; Ell. Control: Center, Cent. Bearings: Roller, Roll.; Ball and roller, B&R.; Plain and ball, Pl&B.; Plain and roller, Pl&R.

Passenger Cars for 1915 Listed with Th

| MAKE AND MODEL | No. of Cylinders | Bore and Stroke, Inches | S. A. E. H. P. | Piston Displacement Cubic Inches | CYLINDERS | | Valve Location | Camshaft Drive | Cooling Circulation | LUBRICATION | | IGNITION | | | CARBURETION | | | CRANKING SYSTEM | |
|--------------------------|------------------|-------------------------|----------------|----------------------------------|-----------|----------|----------------|----------------|---------------------|-------------|--------------|----------|-------------|---------|--------------------|-----------|-------------------------|-----------------|----------------|
| | | | | | Shape | How Cast | | | | System | Type of Pump | System | Make | Control | Make of Carburetor | Fuel Feed | Is Hot Air Pipe Fitted? | Type | Make |
| Kissel, 42..... | 6 | 3.625x5.500 | 31.37 | 309.3 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Splash... | ..... | Single. | Wathse... | Hand. | Stromberg. | ..... | Yes..... | Elec..... | Own..... |
| Kissel, 6-48..... | 6 | 4.000x5.500 | 38.40 | 339.2 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Splash... | ..... | Single. | Men..... | Hand. | Rayfield. | Vacuum. | Yes..... | Elec..... | Own..... |
| Kissel, 6-60..... | 6 | 4.500x5.250 | 48.60 | 501.0 | L-Head.. | Pairs.. | Left... | Chain. | Pump... | Splash... | ..... | Single. | Bosch..... | Hand. | Rayfield. | Pres..... | Yes..... | Elec..... | Own..... |
| Kline, 6-42..... | 6 | 3.500x5.125 | 29.40 | 197.2 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | Wathse... | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Wathse..... |
| Kline, 6-42A..... | 6 | 3.500x5.125 | 29.40 | 197.2 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | Wathse... | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Wathse..... |
| Krit, O..... | 4 | 3.750x4.000 | 22.50 | 176.7 | L-Head.. | Block. | Right.. | Hel'l.. | Thermo. | Splash... | Flwhl.. | Single. | Remy..... | Hand. | Johnson. | Gravity. | Yes..... | Elec..... | Disco..... |
| Krit, M..... | 4 | 3.750x4.000 | 22.50 | 176.7 | L-Head.. | Block. | Right.. | Hel'l.. | Thermo. | Splash... | Flwhl.. | Single. | Bosch..... | Hand. | Stromberg. | Gravity. | Yes..... | Elec..... | North E..... |
| L..... | | | | | | | | | | | | | | | | | | | |
| Lambert, 48-C..... | 4 | 3.750x4.000 | 22.50 | 176.7 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | Briggs..... | Hand. | Schebler. | Gravity. | Yes..... | Elec..... | Briggs..... |
| Lambert, 68-C..... | 4 | 4.125x5.250 | 27.25 | 280.6 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | Briggs..... | Hand. | Schebler. | Gravity. | Yes..... | Elec..... | Briggs..... |
| Lenox, 4..... | 4 | 4.250x5.500 | 29.00 | 312.0 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Wathse... | H&A.. | Own..... | Gravity. | No..... | Elec..... | Wathse..... |
| Lenox, 6..... | 6 | 3.750x5.500 | 33.75 | 364.4 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Wathse... | H&A.. | Own..... | Gravity. | No..... | Elec..... | Wathse..... |
| Lewis, 6..... | 6 | 3.500x6.000 | 29.40 | 346.4 | L-Head.. | Block. | Head.. | Chain. | Pump... | Spl-Pres. | Piston... | Single. | Remy..... | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Remy..... |
| Lexington, 6-L..... | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | Wathse... | H&A.. | Schebler. | Vacuum. | Yes..... | Elec..... | Wathse..... |
| Lexington, 6-M..... | 6 | 4.125x5.000 | 40.90 | 400.9 | L-Head.. | Threes | Right.. | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | At Kent.. | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Jones..... |
| Locomobile, M-5..... | 6 | 4.500x5.500 | 48.60 | 524.8 | T-Head.. | Pairs.. | Opp.... | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Dual.. | Bosch..... | Hand. | Own..... | Pres..... | Yes..... | Elec..... | Wathse..... |
| Locomobile, R-4..... | 6 | 4.250x5.000 | 43.80 | 425.6 | T-Head.. | Pairs.. | Opp.... | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Dual.. | Bosch..... | Hand. | Own..... | Pres..... | Yes..... | Elec..... | Wathse..... |
| Luverne, 760..... | 6 | 4.000x5.000 | 38.60 | 376.9 | L-Head.. | Pairs.. | Left... | Hel'l.. | Thermo. | Splash... | Gear.... | Dup..... | Bosch..... | Hand. | Schebler. | Gravity. | No..... | Elec..... | Jones..... |
| Lyons-Knight, K-4..... | 4 | 4.500x5.500 | 32.40 | 349.9 | Knight.. | Pairs.. | Sleeve. | Chain. | Pump... | Pres..... | Piston... | Dual.. | Simms..... | Hand. | Stromberg. | Gravity. | Yes..... | Elec..... | North-E..... |
| M..... | | | | | | | | | | | | | | | | | | | |
| Maxwell, 25..... | 4 | 3.625x4.500 | 20.25 | 185.8 | L-Head.. | Block. | Right.. | Hel'l.. | Thermo. | Splash... | Piston... | Dual.. | Simms..... | Hand. | Kington. | Gravity. | Yes..... | Elec..... | Huff..... |
| McFarlan, T..... | 6 | 4.000x6.000 | 38.40 | 452.4 | T-Head.. | Block. | Opp.... | Hel'l.. | Pump... | Splash... | ..... | Single. | Wathse... | H&A.. | Stromberg. | Vacuum. | Yes..... | E&A..... | ..... |
| McFarlan, X..... | 6 | 4.500x6.000 | 48.40 | 572.5 | T-Head.. | Block. | Opp.... | Hel'l.. | Pump... | Splash... | ..... | Single. | Wathse... | H&A.. | Stromberg. | Vacuum. | Yes..... | E&A..... | ..... |
| McIntyre, 75..... | 4 | 3.750x4.250 | 22.50 | 187.7 | L-Head.. | Block. | Left... | Spur... | Thermo. | Splash... | Piston... | Single. | Bosch..... | Hand. | Holley. | Gravity. | Yes..... | Elec..... | Spfld-A..... |
| McIntyre, 6-10..... | 6 | 3.500x4.500 | 29.40 | 259.8 | T-Head.. | Block. | Opp.... | Chain. | Thermo. | Splash... | Piston... | Single. | Briggs..... | Hand. | Stromberg. | Gravity. | Yes..... | Elec..... | Briggs..... |
| Meteor, 42..... | 4 | 4.000x5.000 | 25.60 | 251.3 | L-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | At Kent.. | H&A.. | ..... | Gravity. | Yes..... | Elec..... | Spfld-A..... |
| Meteor, 45..... | 6 | 3.750x5.000 | 33.60 | 331.4 | L-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | At Kent.. | H&A.. | ..... | Gravity. | Yes..... | Elec..... | Spfld-A..... |
| Metz, 22..... | 4 | 3.750x4.000 | 22.50 | 176.7 | L-Head.. | Block. | Right.. | Spur... | Thermo. | Splash... | Gear.... | Single. | Bosch..... | Fixed. | ..... | Gravity. | Opt..... | Elec..... | G. & D..... |
| Mitchell-Lewis, 4..... | 4 | 4.000x5.500 | 25.60 | 276.5 | L-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | Conn..... | Hand. | ..... | Vacuum. | Yes..... | Elec..... | Spfld-A..... |
| Mitchell-Lewis, 6..... | 6 | 4.000x5.500 | 38.40 | 414.8 | L-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | Conn..... | Hand. | ..... | Vacuum. | Yes..... | Elec..... | Spfld-A..... |
| Mitchell-Lewis, 7-6..... | 6 | 4.250x7.000 | 43.80 | 595.8 | T-Head.. | Pairs.. | Opp.... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Remy..... | Hand. | ..... | Gravity. | Yes..... | Elec..... | Remy..... |
| Mitchell-Lewis, 5-6..... | 6 | 4.250x6.000 | 43.80 | 430.6 | T-Head.. | Pairs.. | Opp.... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Remy..... | Hand. | ..... | Gravity. | Yes..... | Elec..... | Remy..... |
| Moline-Knight..... | 4 | 4.000x6.000 | 25.60 | 301.6 | Knight.. | Block. | Sleeve. | Chain. | Thermo. | Spl-Pres. | Gear.... | Dual.. | Bosch..... | Hand. | Schebler. | Pres..... | Yes..... | Elec..... | Wagner..... |
| Marmion, 41..... | 6 | 4.250x5.500 | 43.80 | 468.0 | L-Head.. | Threes | Right.. | Hel'l.. | Pump... | Pres..... | Gear.... | Dual.. | Bosch..... | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Bosch..... |
| Marmion, 48..... | 6 | 4.500x6.000 | 48.60 | 577.5 | T-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Pres..... | Gear.... | 2-pt.. | Bosch..... | Hand. | Zenith. | Pres..... | Yes..... | Elec..... | Bosch..... |
| Monarch, 6..... | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | At Kent.. | Auto.. | Zephyr... | Gravity. | Yes..... | Elec..... | Ward..... |
| Moon, 4-38..... | 4 | 3.750x5.000 | 22.50 | 220.9 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | ..... | Dual.. | Delco..... | Hand. | Opt..... | Vacuum. | ..... | Elec..... | Delco..... |
| Moon, 6-40..... | 6 | 3.500x5.000 | 29.45 | 288.4 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | ..... | Dual.. | Delco..... | Hand. | Opt..... | Vacuum. | ..... | Elec..... | Delco..... |
| Morse, D-4..... | 4 | 4.625x5.000 | 34.28 | 336.0 | L-Head.. | Singly. | Head.. | Spur... | Pump... | Splash... | Gear.... | Dual.. | Eisemann. | Hand. | Stromberg. | Gravity. | Yes..... | Elec..... | G. & D..... |
| N..... | | | | | | | | | | | | | | | | | | | |
| National, AA..... | 6 | 3.750x5.500 | 33.75 | 364.4 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | Eisemann. | Hand. | Rayfield. | Pres..... | Yes..... | Elec..... | Remy..... |
| Norwalk, F..... | 6 | 3.500x5.125 | 29.45 | 295.9 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | At Kent.. | H&A.. | Rayfield. | Vacuum. | Yes..... | Elec..... | G. & D..... |
| O..... | | | | | | | | | | | | | | | | | | | |
| Oakland, 37..... | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Delco..... | H&A.. | Marvel... | Vacuum. | Yes..... | Elec..... | Delco..... |
| Oakland, 49..... | 6 | 3.500x5.000 | 29.45 | 288.4 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Delco..... | H&A.. | Johnson. | Vacuum. | Yes..... | Elec..... | Delco..... |
| Oldsmobile, 42..... | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head.. | Block. | Head.. | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Delco..... | Auto.. | Marvel... | Pres..... | Yes..... | Elec..... | Delco..... |
| Oldsmobile, 55..... | 6 | 4.250x5.250 | 43.80 | 446.7 | L-Head.. | Pairs.. | Head.. | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Delco..... | Auto.. | Marvel... | Pres..... | Yes..... | Elec..... | Delco..... |
| Overland 80..... | 4 | 4.125x4.500 | 27.25 | 240.5 | L-Head.. | Singly. | Left... | Hel'l.. | Thermo. | Splash... | Gear.... | Single. | Bosch..... | Hand. | Schebler. | Gravity. | Yes..... | Elec..... | Auto-lite..... |
| Overland 81..... | 4 | 4.000x4.500 | 25.60 | 226.2 | L-Head.. | Singly. | Left... | Hel'l.. | Thermo. | Splash... | Gear.... | Single. | Splitdorf. | Hand. | Schebler. | Gravity. | Yes..... | Elec..... | Auto-lite..... |
| Overland 82..... | 6 | 3.500x5.250 | 29.40 | 303.1 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Splash... | Piston... | Single. | Bosch..... | Hand. | Schebler. | Vacuum. | Yes..... | Elec..... | Auto-lite..... |
| Owen..... | 6 | 3.625x5.500 | ..... | ..... | L-Head.. | Block. | Head.. | Hel'l.. | Pump... | Pres..... | Gear.... | Dual.. | Remy..... | Hand. | ..... | ..... | ..... | Elec..... | Own..... |
| P..... | | | | | | | | | | | | | | | | | | | |
| Packard 3-38..... | 6 | 4.000x5.500 | 38.40 | 414.7 | L-Head.. | Threes | Right.. | Hel'l.. | Pump... | Pres..... | Gear.... | Single. | Bosch..... | Hand. | Own..... | Pres..... | Yes..... | Elec..... | Bijur..... |
| Packard, 5-48..... | 6 | 4.500x5.500 | 48.60 | 524.8 | L-Head.. | Threes | Right.. | Hel'l.. | Pump... | Pres..... | Gear.... | Single. | Bosch..... | Hand. | Own..... | Pres..... | Yes..... | Elec..... | Bijur..... |
| Paige-Detroit, 6..... | 6 | 3.500x5.250 | 29.45 | 303.1 | L-Head.. | Block. | Right.. | Worm. | Pump... | Splash... | Gear.... | Dual.. | Bosch..... | Hand. | ..... | Gravity. | Yes..... | Elec..... | G. & D..... |
| Partin-Palmer, 20..... | 4 | 3.125x4.000 | 15.64 | 122.7 | L-Head.. | Block. | Left... | Hel'l.. | Thermo. | Splash... | Gear.... | Single. | At Kent.. | Hand. | Muir..... | Gravity. | Yes..... | Elec..... | G. & D..... |
| Partin-Palmer, 38..... | 4 | 3.750x5.250 | 22.50 | 231.9 | L-Head.. | Block. | Head.. | Hel'l.. | Thermo. | Splash... | Gear.... | Single. | At Kent.. | Auto.. | Stromberg. | Gravity. | Yes..... | Elec..... | G. & D..... |
| Paterason, 4-32..... | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head.. | Block. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Delco..... | Hand. | Stromberg. | Gravity. | Yes..... | Elec..... | Delco..... |
| Paterason, 6-48..... | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Pairs.. | Left... | Hel'l.. | Pump... | Spl-Pres. | Piston... | Dual.. | Delco..... | Hand. | Stromberg. | Vacuum. | Yes..... | Elec..... | Delco..... |
| Pathfinder..... | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head.. | Threes | Right.. | Hel'l.. | Pump... | Spl-Pres. | Gear.... | Single. | Wathse... | Hand. | Schebler. | Gravity. | Yes..... | Elec..... | Wathse..... |
| Peerless, 54..... | 4 | 3.750x5.000 | 22.50 | 220.9 | L-Head.. | Block. | Right.. | Hel'l.. | Thermo. | Spl-Pres. | Piston... | Single. | At Kent.. | H&A.. | Stromberg. | Vacuum. | Yes..... | Elec..... | G. & D..... |
| Peerless, 55..... | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head.. | Block. | Right.. | Hel'l.. | Pump... | Spl-Pres. | Piston... | Single. | At Kent.. | H&A.. | Stromberg. | Vacuum. | Yes..... | Elec..... | G. & D..... |
| Peerless, 48..... | 6 | 4.500x6.000 | 48.60 | 577.5 | T-Head.. | Pairs.. | Opp.... | Hel'l.. | Pump... | Splash... | Piston... | Dual.. | Bosch..... | Hand. | Own..... | Pres..... | No..... | Elec..... | G. & D..... |

ABBREVIATIONS:—Valve Location: Side and head, S & H.; Left and right, L & R. Camshaft Drive: Helical gears, Hel'l.; Spur gears, Spur. Cooling Circulation: Thermo-siphon, Thermo. Lubrication System: Splash and pressure, Spl-Pres.; Pressure, Pres. Type of Pump: Flywheel, Flwhl.; Rotary, Rot.; Centrifugal, Cent. Ignition System: Double, Doub.; Two-point, 2-Pt. Ignition Make: Westinghouse, Wathse.; Atwater Kent, At Kent.; Connecticut, Conn. Ignition Control: Automatic, Auto.; Hand and automatic, H&A.; Hand or fixed, H or F. Make of Carburetor: Optional, Opt. Fuel Feed: Pressure-gravity, Pres-Gr. Type of Cranking System: Electric, Elec.; Electric and air, E. & Air.

*60-inch tread optional. **Tread more or less than standard except Scripps-Booth, which is optional. ***The Entz system comprising motor and generator replaces the gearbox

Principal Specifications—Continued

| Lighting System | TRANSMISSION | | | | | | | | RUNNING GEAR | | | | CONTROL | | BEARINGS | | | | MAKE AND MODEL | |
|-----------------|--------------|-----------|-------------|---------------|-------------|--------------------|----------------|----------------------------|--------------|-------|------|-----------|--------------|-------------------------|--------------------|-------------------------|-----------|-----------|----------------|---------------------|
| | Clutch Type | GEARSET | | | Final Drive | Car Drives Through | Rear Axle | Total Gear Ratio on Direct | Wheel-base | TIRES | | Wheels | Rear Springs | Location Steering Wheel | Gearshift Location | Crankshaft Type and No. | Gearset | Rear Axle | | Front Wheel |
| | | Type | Location | Forward Sp'ds | | | | | | Front | Rear | | | | | | | | | |
| Wathae..... | Cone..... | Sel..... | Amid..... | 3 | Bevel..... | Springs..... | Float..... | ..... | 126 | 35x4 | 35x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain..... | Ball..... | Roll..... | Ball..... | Kissel, 42 |
| Esterline..... | Cone..... | Sel..... | Unit M..... | 4 | Bevel..... | Springs..... | Float..... | 4.00-1 | 132 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | Kissel, 6-48 |
| Esterline..... | Cone..... | Sel..... | Amid..... | 4 | Bevel..... | Springs..... | Float..... | 3.75-1 | 142 | 37x5 | 37x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | Kissel, 6-60 |
| Wathae..... | Diak..... | Sel..... | Unit M..... | 3 | Sp Bev..... | Springs..... | 1/2 Float..... | 3.75-1 | 123 | 34x4 | 34x4 | Wood..... | 1/2 Ell..... | Left..... | Cent..... | Plain, 4..... | B&R..... | Ball..... | Roll..... | Kline, 6-42 |
| Wathae..... | Diak..... | Sel..... | Unit M..... | 3 | Sp Bev..... | Springs..... | 1/2 Float..... | 3.75-1 | 123 | 34x4 | 34x4 | Wood..... | 1/2 Ell..... | Left..... | Cent..... | Plain, 4..... | B&R..... | Ball..... | Roll..... | Kline, 6-42 |
| Disco..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Tor T..... | Semi F..... | 4.00-1 | 108 | 32x3 | 32x3 | Wood..... | Ell..... | Left..... | Left..... | Ball, 2..... | B&Pl..... | B&R..... | Ball..... | Krit, O |
| North E..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Tor T..... | Semi F..... | 4.00-1 | 108 | 32x3 | 32x3 | Wood..... | Ell..... | Left..... | Cent..... | Ball, 2..... | B&Pl..... | B&R..... | Ball..... | Krit, M |
| Briggs..... | Frie..... | Amid..... | ..... | ..... | Chain..... | Rad Rd..... | Semi F..... | ..... | 112* | 32x3 | 32x3 | Wood..... | Ell..... | Left..... | Cent..... | Plain, 3..... | ..... | B&R..... | Ball..... | Lambert, 48-C |
| Briggs..... | Frie..... | Amid..... | ..... | ..... | Chain..... | Rad Rd..... | Semi F..... | ..... | 117 | 34x3 | 34x3 | Wood..... | Ell..... | Right..... | Cent..... | Plain, 3..... | ..... | B&R..... | Ball..... | Lambert, 68-C |
| Wathae..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | 1/2 Float..... | 3.30-1 | 118 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Ball..... | Lenox, 4 |
| Wathae..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | 1/2 Float..... | 3.07-1 | 130 | 34x4 | 34x4 | Opt..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Ball..... | Ball..... | Lenox, 6 |
| Remy..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Tor Rd..... | 1/2 Float..... | 3.75-1 | 135 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain..... | Ball..... | Ball..... | Ball..... | Lewis, 6 |
| Wathae..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 128 | 34x4 | 34x4 | Wood..... | Cant..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Ball..... | Lexington, 6-L |
| Jones..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | ..... | 130 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Roll..... | Roll..... | Lexington, 6-M |
| Wathae..... | Diak..... | Sel..... | Amid..... | 4 | Bevel..... | Rad Rd..... | Float..... | 3.50-1 | 140 | 37x5 | 37x5 | Opt..... | 1 Ell..... | Left..... | Cent..... | Plain, 7..... | Ball..... | Ball..... | Roll..... | Locomobile, M-5 |
| Wathae..... | Diak..... | Sel..... | Amid..... | 4 | Bevel..... | Rad Rd..... | Float..... | 3.80-1 | 132 | 36x4 | 37x5 | Opt..... | 1 Ell..... | Left..... | Cent..... | Plain, 7..... | Ball..... | Ball..... | Roll..... | Locomobile, R-4 |
| Jones..... | Diak..... | Unit..... | Unit M..... | 3 | Bevel..... | Rad Rd..... | Float..... | 4.00-1 | 128 | 36x4 | 36x4 | Wood..... | Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | B&R..... | Roll..... | Luverne, 760 |
| North E..... | Diak..... | Sel..... | Rear A..... | 3 | Worm..... | Tor T..... | Float..... | 3.87-1 | 130 | 37x5 | 37x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 5..... | Ball..... | Roll..... | Roll..... | Lyons-Knight, K-4 |
| Huff..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Tor T..... | 1/2 Float..... | 3.58-1 | 102 | 30x3 | 30x3 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 2..... | R&Pl..... | Roll..... | Ball..... | M |
| Wathae..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.58-1 | 132 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Roll..... | Roll..... | Ball..... | Maxwell, 25 |
| Wathae..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.58-1 | 132 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Roll..... | Roll..... | Ball..... | McFarlan, T |
| Spdlf-Ap..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Semi F..... | 4.00-1 | 106 | 30x3 | 30x3 | Wood..... | Cant..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Ball..... | McIntyre, 75 |
| Briggs..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 120 | 35x4 | 35x4 | Wood..... | 1 Ell..... | Right..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Ball..... | McIntyre, 6-40 |
| Spdlf-Ap..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 3.70-1 | 114 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Ball..... | Meteor, 42 |
| Spdlf-Ap..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 3.70-1 | 126 | 35x4 | 35x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Ball..... | Meteor, 45 |
| G. & D..... | Frie..... | Amid..... | ..... | 7 | Chain..... | Rad Rd..... | Dead..... | 2.81-1 | 96 | 30x3 | 30x3 | Wood..... | Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Ball..... | Metz, 22 |
| Spdlf-Ap..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 116 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | B&R..... | Roll..... | Roll..... | Mitchell-Lewis, 4 |
| Spdlf-Ap..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 127 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | B&R..... | Roll..... | Roll..... | Mitchell-Lewis, 6 |
| Remy..... | Cone..... | Sel..... | Amid..... | 3 | Bevel..... | Tor T..... | Float..... | 3.35-1 | 144 | 37x5 | 37x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | Mitchell-Lewis, 7-6 |
| Remy..... | Cone..... | Sel..... | Amid..... | 3 | Bevel..... | Tor T..... | Float..... | 3.35-1 | 132 | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | Mitchell-Lewis, 5-6 |
| Wagner..... | Cone..... | Sel..... | Amid..... | 4 | Bevel..... | Tor T..... | Float..... | ..... | 128 | 36x4 | 36x4 | Opt..... | S-E..... | Left..... | Cent..... | Plain, 3..... | Ball..... | B&R..... | Ball..... | Moline-Knight |
| Bosch..... | Cone..... | Sel..... | Amid..... | 3 | Sp Bev..... | Springs..... | Float..... | ..... | 132** | 36x4 | 36x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 7..... | Ball..... | Roll..... | Roll..... | Marmion, 41 |
| Bosch..... | Diak..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.46-1 | 145 | 36x4 | 37x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 7..... | Ball..... | B&R..... | Roll..... | Marmion, 48 |
| Rob-Myr..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Rad Rd..... | 1/2 Float..... | 4.00-1 | 125 | 33x4 | 33x4 | Wood..... | Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | B&R..... | Ball..... | Monarch, 6 |
| Delco..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 122 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Left..... | Plain, 3..... | Roll..... | Ball..... | Roll..... | Moon, 4-38 |
| Delco..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 122 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Roll..... | Ball..... | Roll..... | Moon, 6-40 |
| G. & D..... | Diak..... | Sel..... | Amid..... | 4 | Bevel..... | Tor T..... | Semi F..... | 3.00-1 | 127 | 36x4 | 36x4 | Wood..... | Ell..... | Right..... | Cent..... | Plain, 5..... | Ball..... | Ball..... | Ball..... | Morse, D-4 |
| Remy..... | Cone..... | Sel..... | Amid..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 132 | 36x4 | 36x4 | Wood..... | Cant..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | N |
| G. & D..... | Diak..... | Sel..... | Unit M..... | 4 | Bevel..... | Springs..... | Semi F..... | 4.08-1 | 131 | 37x4 | 37x4 | Wood..... | S-E..... | Left..... | Cent..... | Plain, 4..... | Ball..... | Roll..... | Roll..... | National, AA |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 112 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Roll..... | B&R..... | Ball..... | Norwalk, F |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 123 | 35x4 | 35x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | B&R..... | Ball..... | O |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 112 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | B&R..... | Roll..... | Roll..... | Oakland, 37 |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 139 | 36x5 | 36x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | B&R..... | Ball..... | Roll..... | Oakland, 49 |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 112 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | B&R..... | Roll..... | Roll..... | Oldsmobile, 42 |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | 1/2 Float..... | 4.00-1 | 139 | 36x5 | 36x5 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | B&R..... | Ball..... | Roll..... | Oldsmobile, 55 |
| Auto-lite..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.75-1 | 114 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 5..... | Ball..... | Roll..... | Roll..... | Overland, 80 |
| Auto-lite..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.75-1 | 106 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 5..... | Ball..... | Roll..... | Roll..... | Overland, 81 |
| Auto-lite..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 4.00-1 | 125 | 35x4 | 35x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Roll..... | Roll..... | Overland, 82 |
| Owen..... | Elec..... | El*** | Amid..... | ..... | Bevel..... | ..... | Float..... | 3.00-1 | 136 | 35x5 | 35x5 | Opt..... | S-E..... | Left..... | Cent..... | Plain, 3..... | ..... | Roll..... | Roll..... | Owen |
| Bijur..... | Diak..... | Prog..... | Rear A..... | 3 | Sp Bev..... | Rad Rd..... | Non-F..... | 3.93-1 | 140 | 36x4 | 37x5 | Wood..... | 1 Ell..... | Left..... | Left..... | Plain, 7..... | Ball..... | Ball..... | Roll..... | P |
| Bijur..... | Diak..... | Prog..... | Rear A..... | 3 | Sp Bev..... | Rad Rd..... | Non-F..... | 3.93-1 | 144 | 37x5 | 37x5 | Wood..... | 1 Ell..... | Left..... | Left..... | Plain, 7..... | Ball..... | Ball..... | Roll..... | Packard, 3-38 |
| G. & D..... | Diak..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 4.07-1 | 124 | 34x4 | 34x4 | Wood..... | Cant..... | Left..... | Cent..... | Plain, 3..... | Ball..... | B&R..... | Ball..... | Packard, 5-48 |
| G. & D..... | Diak..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 4.20-1 | 96 | 28x3 | 28x3 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 2..... | Roll..... | Roll..... | Ball..... | Paige-Detroit, 6 |
| G. & D..... | Cone..... | Sel..... | Rear A..... | 3 | Bevel..... | Tor T..... | Float..... | 3.75-1 | 115 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Roll..... | Roll..... | Ball..... | Partin-Palmer, 20 |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 4.00-1 | 112 | 33x4 | 33x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 3..... | Ball..... | B&R..... | Ball..... | Partin-Palmer, 38 |
| Delco..... | Cone..... | Sel..... | Unit M..... | 3 | Bevel..... | Springs..... | Float..... | 3.75-1 | 124 | 34x4 | 34x4 | Wood..... | 1 Ell..... | Left..... | Cent..... | Plain, 4..... | Ball..... | B&R..... | Ball..... | Paterson, 4-32 |
| Wathae..... | Diak..... | Sel..... | Unit M..... | 4 | Bevel..... | Tor T..... | Float..... | 3.75-1 | 125 | 34x4 | 34x4 | Wood..... | Cant..... | Left..... | Cent..... | Plain, 3..... | Ball..... | Ball..... | Roll..... | Paterson, 6-48 |
| G. & D..... | Diak..... | Sel..... | Unit M..... | 3 | Sp Bev..... | Springs..... | Semi F..... | 4.50-1 | 113 | 34x4 | 34x4 | Wood..... | Plat..... | Left..... | Cent..... | Plain, 3..... | B&R..... | Roll..... | Roll..... | Pathfinder |
| G. & D..... | Diak..... | Sel..... | Unit M..... | 3 | Sp Bev..... | Springs..... | Semi F..... | 4.00-1 | 121 | 34x4 | 34x4 | Wood..... | Plat..... | Left..... | Cent..... | Plain, 3..... | B&R..... | Roll..... | Roll..... | Peerless, 54 |
| G. & D..... | Exp Bd..... | Sel..... | Amid..... | 4 | Sp Bev..... | Rad Rd..... | Float..... | 3.35-1 | 137 | 37x5 | 37x5 | Wood..... | Plat..... | Opt..... | Opt..... | Plain, 7..... | Ball..... | Ball..... | Roll..... | Peerless, 55 |
| | | | | | | | | | | | | | | | | | | | | Peerless, 48 |

ABBREVIATIONS:—Make of Cranking System: North East, North-E.; Gray & Davis, G. & D.; Ward Leonard, Ward L.; Bosch-Rushmore, Bosch-R.; Allis-Chalmers, Allis-C.; Leeco-Neville, Leeco-Nev.; Splidorf-Apple, Splid-Ap.; Entz-Dyneto, Entz-Dyn.; Robbins & Meyers, Rob-Myr.; Hendricks, Hendrix. Clutch Type: Contracting band, Con Bd.; Expanding band, Exp Bd. Gearset Type: Selective, Sel.; Progressive, Prog.; Frictional, Frie.; Planetary, Plan. Gearset Location: Unit with motor, Unit M.; Amidships, Amid.; Rear Axle, Rear A. Final Drive: Spiral bevel, Sp Bev. Car Drives Through: Radius rod, Rad Rd.; Torsion tube, Tor T.; Torsion arm, Tor A. Rear Axle: Floating, Float.; Semi-floating, Semi F.; 1/2 floating, 1/2 Float.; Non-floating, Non-Float. Rear Springs: 1 elliptic, 1 Ell. Elliptic, Ell.; Cantilever, Cant.; Semi-elliptic, Semi E.; Platform, Plat. Control: Center, Cent. Bearings: Roller, Roll.; Ball and roller, B&R.; Plain and ball, Pl&B.; Plain and roller, Pl&R.

Passenger Cars for 1915 Listed with Th

| MAKE AND MODEL | No. of Cylinders | Bore and Stroke, inches | S. A. E. H. P. | Piston Displacement Cubic Inches | CYLINDERS | | Valve Location | Camshaft Drive | Cooling Circulation | LUBRICATION | | IGNITION | | | CARBURETION | | | CRANKING SYSTEM | |
|----------------------|------------------|-------------------------|----------------|----------------------------------|-----------|----------|----------------|----------------|---------------------|-------------|--------------|----------|-----------|---------|--------------------|-----------|-------------------------|-----------------|---------|
| | | | | | Shape | How Cast | | | | System | Type of Pump | System | Make | Control | Make of Carburetor | Fuel Feed | Is Hot Air Pipe Fitted? | Type | Make |
| Peter Pan | 4 | 2.750x4.125 | 12.08 | 392.9 | I-Head | Block | Head | | Thermo | | | Single | Berling | Hand | | | | Mech'l | |
| Pierce-Arrow, 38 | 6 | 4.000x5.500 | 38.40 | 414.7 | T-Head | Pairs | Opp... | Hel'l | Pump... | Pres | Gear... | Doub. | Bosch | Hand | Own | Pres | Yes | Elec | Wathse |
| Pierce-Arrow, 48 | 6 | 4.500x5.500 | 48.60 | 529.8 | T-Head | Pairs | Opp... | Hel'l | Pump... | Pres | Gear... | Doub. | Bosch | Hand | Own | Pres | Yes | Elec | Wathse |
| Pierce-Arrow, 66 | 6 | 5.000x7.000 | 60.00 | 824.8 | T-Head | Pairs | Opp... | Hel'l | Pump... | Pres | Gear... | Doub. | Bosch | Hand | Own | Pres | Yes | Elec | Wathse |
| Pilot, 55 | 6 | 3.500x5.250 | 29.40 | 303.1 | T-Head | Block | Opp... | Hel'l | Pump... | Splash | | Single | | Hand | Schebler | Gravity | Yes | Elec | Wathse |
| Pilot, 75 | 6 | 4.500x6.000 | 32.40 | 381.7 | T-Head | Block | Opp... | Hel'l | Pump... | Splash | | Single | | Hand | Opt. | Pres | Yes | Elec | Wathse |
| Pratt, 4-40 | 4 | 4.125x5.250 | 27.25 | 280.6 | L-Head | Block | Left... | Hel'l | Pump... | Spl-Pre | Piston... | Dual. | At Kent | Auto. | Rayfield | Gravity | Yes | Elec | G. & D. |
| Pratt, 6-59 | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head | Threes | Right | Hel'l | Pump... | Spl-Pre | Piston... | Dual. | At Kent | Auto. | Rayfield | Gravity | Yes | Elec | G. & D. |
| Premier-Weidely, A | 6 | 3.625x5.250 | 31.57 | 234.8 | I-Head | Block | Head | Hel'l | Pump... | Spl-Pre | Gear... | Single | Eisemann | Hand | Rayfield | Vacuum | Yes | Elec | Remy |
| Pullman-Junior | 4 | 3.750x4.250 | 22.50 | 187.7 | L-Head | Block | Left... | Chain | Thermo | Spl-Pre | Piston... | Single | | Hand | | Gravity | Yes | Elec | Spld-Ap |
| Pullman, 6-48 | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head | Threes | Right | Hel'l | Pump... | Spl-Pre | Gear... | Dual. | | Hand | | Gravity | Yes | Elec | Wathse |
| R | | | | | | | | | | | | | | | | | | | |
| Rayfield, 20 | 4 | 2.750x4.500 | 12.08 | 106.4 | L-Head | Block | Right | Spur | Thermo | Spl-Pre | Gear... | Single | | Hand | Rayfield | Gravity | Yes | None | |
| R-C-H, K | 4 | 3.250x5.000 | 25.39 | 165.9 | L-Head | Block | Left... | Spur | Thermo | Splash | Cent... | Single | Bosch | Fixed | B-D | Gravity | Yes | Elec | Ward L |
| Regal, D | 4 | 3.750x5.000 | 22.50 | 220.9 | L-Head | Block | Left... | Hel'l | Thermo | Splash | Piston... | Dual. | At Kent | Auto. | Stewart | Gravity | Yes | Elec | Bosch R |
| Remington | 4 | 2.750x4.500 | 12.03 | 106.4 | L-Head | Block | Right | Spur | Thermo | Spl-Pre | Piston... | Single | At Kent | Auto. | Mayer | Gravity | No | Elec | Ward L |
| Reo, R | 4 | 4.125x4.500 | 27.20 | 240.5 | L-Head | Pairs | S&H | Hel'l | Pump... | Splash | Piston... | Dual. | Remy | Hand | Holley | Gravity | Yes | Elec | Remy |
| Reo, ST | 4 | 4.125x4.500 | 27.20 | 240.5 | L-Head | Pairs | S&H | Hel'l | Pump... | Splash | Piston... | Dual. | Remy | Hand | Holley | Gravity | Yes | Elec | Remy |
| Reo, M | 6 | 3.562x5.125 | 30.51 | 306.6 | L-Head | Threes | S&H | Hel'l | Pump... | Splash | Piston... | Dual. | Remy | Hand | Johnson | Gravity | Yes | Elec | Remy |
| Republic, E | 6 | 4.250x5.000 | 43.80 | 425.6 | T-Head | Pairs | Opp... | Spur | Pump... | Pres | Gear... | Dual. | Delco | Hand | Rayfield | Vacuum | Yes | Elec | Delco |
| S | | | | | | | | | | | | | | | | | | | |
| Saxon, A | 4 | 2.625x4.000 | 11.00 | 87.4 | L-Head | Block | Left... | Hel'l | Thermo | Splash | Vacuum | Single | At Kent | Auto. | Mayer | Gravity | Yes | | |
| Saxon, B | 6 | 2.875x4.500 | 20.00 | 175.3 | L-Head | Block | Right | Hel'l | Thermo | Splash | Piston... | Single | At Kent | Auto. | Mayer | Gravity | | | |
| Scripps-Booth, C | 4 | 2.875x4.000 | 13.37 | 103.6 | I-Head | Block | Head... | Hel'l | Thermo | Splash | Piston... | Single | At Kent | Auto. | Zenith | Gravity | Yes | Elec | Bijur |
| S-G-V, J | 4 | 3.875x4.375 | 24.22 | 206.4 | L-Head | Block | Right | Chain | Pump... | Pres | Gear... | Single | Bosch | Hand | Zenith | Pres | Yes | Elec | Ward L |
| Simplex, 38 | 4 | 4.875x6.500 | 34.00 | 485.3 | T-Head | Pairs | Opp... | Spur | Pump... | Splash | Gear... | Dual. | Bosch | Hand | Newcomb | Pres | No | Elec | Bosch R |
| Simplex, 50 | 4 | 5.375x6.500 | 46.00 | 590.0 | T-Head | Pairs | Opp... | Spur | Pump... | Splash | Gear... | Dual. | Bosch | Hand | Newcomb | Pres | No | Elec | Bosch R |
| Singer, 6 | 6 | 4.000x5.500 | 33.40 | 414.7 | T-Head | Threes | Opp... | Hel'l | Pump... | Spl-Pre | Gear... | Dual. | Eisemann | Hand | C.R.G. | Pres | No | Elec | Wathse |
| Spaulding | 4 | 4.250x5.500 | 28.90 | 321.0 | L-Head | Block | Right | Hel'l | Pump... | Spl-Pre | Piston... | Dual. | Simms | Hand | Rayfield | Gravity | Yes | Elec | Entz |
| Speedwell, I | 6 | 4.125x5.250 | 40.90 | 420.9 | Dome | Threes | Rot... | | Pump... | Spl-Pre | Gear... | Single | Wathse | Hand | Schebler | Vacuum | Yes | Elec | Wathse |
| Sphinx, A-15 | 4 | 3.375x5.000 | 18.21 | 178.9 | L-Head | Block | Right | Hel'l | Thermo | Splash | Piston... | Single | Splitdorf | Hand | Muir | Gravity | Yes | Elec | Spld-Ap |
| Stearns, 4 | 4 | 3.750x5.625 | 22.50 | 248.5 | Knight | Block | Sleeve | Chain | Pump... | Pres | Gear... | Single | Bosch | Hand | | Gravity | Yes | Elec | G. & D. |
| Stearns, Big 4 | 4 | 4.250x5.500 | 28.90 | 312.0 | Knight | Pairs | Sleeve | Chain | Pump... | Splash | Gear... | Dual. | Bosch | Hand | Stromberg | Pres | Yes | Elec | G. & D. |
| Stearns, 6 | 6 | 4.250x5.750 | 43.80 | 489.4 | Knight | Pairs | Sleeve | Chain | Pump... | Spl-Pre | Gear... | Dual. | Bosch | Hand | Stromberg | Pres | Yes | Elec | G. & D. |
| Stevens-Duryea, D-6 | 6 | 4.375x5.500 | 46.00 | 496.1 | L-Head | Pairs | Right | Hel'l | Pump... | Spl-Pre | Piston... | Doub. | Bosch | Hand | Own | Gravity | Yes | Elec | Delco |
| Stevens-Duryea, DD-6 | 6 | 4.437x5.500 | 47.30 | 510.4 | L-Head | Pairs | Right | Hel'l | Pump... | Spl-Pre | Piston... | Doub. | Bosch | Hand | Own | Gravity | Yes | Elec | Delco |
| Studebaker, 4 SD | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head | Block | Left... | Hel'l | Pump... | Splash | Piston... | Single | Remy | Hand | Schebler | Gravity | No | Elec | Wagner |
| Studebaker, 6 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head | Block | Left... | Hel'l | Pump... | Splash | Piston... | Single | Remy | Hand | Schebler | Gravity | Yes | Elec | Wagner |
| Stutz, H.C.S. | 4 | 3.750x5.000 | 22.50 | 221.0 | L-Head | Block | Right | Spur | Thermo | Pres | Gear... | Dual. | Remy | Hand | Stromberg | Gravity | Yes | Elec | Remy |
| Stutz, 40 | 4 | 4.750x5.000 | 36.10 | 389.9 | T-Head | Pairs | Opp... | Spur | Pump... | Pres | Gear... | Doub. | Bosch | Hand | Stromberg | Gravity | Yes | Elec | Remy |
| Stutz, 40 | 4 | 4.750x5.000 | 36.10 | 389.9 | T-Head | Pairs | Opp... | Spur | Pump... | Pres | Gear... | Dual. | Eisemann | Hand | Stromberg | Pres | Yes | Elec | Remy |
| Stutz, 6 | 6 | 4.000x5.000 | 38.40 | 376.9 | T-Head | Threes | Opp... | Spur | Pump... | Pres | Gear... | Single | Eisemann | Hand | Stromberg | Gravity | Yes | Elec | Remy |
| Stutz, 6 | 6 | 4.000x5.000 | 38.40 | 376.9 | T-Head | Threes | Opp... | Spur | Pump... | Pres | Gear... | Single | Eisemann | Hand | Stromberg | Gravity | Yes | Elec | Remy |
| T | | | | | | | | | | | | | | | | | | | |
| Touraine, 12 | 6 | 4.000x5.500 | 38.40 | 414.7 | T-Head | Threes | Opp... | Hel'l | Pump... | Spl-Pre | Gear... | Dual. | Simms | Hand | Zenith | Pres | Yes | Elec | Wathse |
| Touraine, 12 | 6 | 4.000x5.500 | 38.40 | 414.7 | T-Head | Threes | Opp... | Hel'l | Pump... | Spl-Pre | Gear... | Dual. | Simms | Hand | Zenith | Pres | Yes | Elec | Wathse |
| Trumbull, 15 A | 4 | 2.875x4.000 | 26.74 | 103.6 | 2-cycle | Block | Right | Hel'l | Thermo | Spl-Pre | Piston... | Single | Splitdorf | Fixed | Zephyr | Gravity | Yes | Elec | Ward L |
| Twombly | 4 | 3.125x4.000 | 15.64 | 122.7 | L-Head | Block | Left... | Hel'l | Thermo | Splash | Piston... | Single | Splitdorf | Hand | Opt | Gravity | Yes | Opt | Opt |
| V | | | | | | | | | | | | | | | | | | | |
| Velie, 12 | 4 | 4.625x5.250 | 34.25 | 352.8 | L-Head | Pairs | Left... | Chain | Pump... | Splash | Piston... | Dual. | Bosch | Hand | Stromberg | Gravity | Yes | Elec | G. & D. |
| Velie, 14 | 6 | 3.750x5.250 | 33.75 | 347.8 | L-Head | Threes | Right | Hel'l | Pump... | Splash | Gear... | Dual. | Bosch | Hand | Stromberg | Pres | Yes | Elec | G. & D. |
| Velie, 15 | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head | Block | Right | Hel'l | Pump... | Spl-Pre | Piston... | Dup. | At Kent | Auto. | Stromberg | Gravity | Yes | Elec | G. & D. |
| Vixen, S-B | 4 | 2.750x4.000 | 12.08 | 95.0 | L-Head | Block | Left... | Spur | Thermo | Splash | Cent... | Single | At Kent | Hand | Zephyr | Gravity | Yes | None | |
| Vulcan, 35 | 4 | 3.500x5.125 | 19.60 | 197.2 | L-Head | Block | Right | Spur | Pump... | Spl-Pre | Gear... | Single | Wathse | Hand | | Gravity | | Elec | Wathse |
| W | | | | | | | | | | | | | | | | | | | |
| Westcott, O | 4 | 3.500x5.000 | 19.60 | 192.4 | L-Head | Block | Left... | Hel'l | Pump... | Splash | Piston... | Dual. | Delco | Auto. | | | | Elec | Delco |
| Westcott, U | 6 | 3.500x5.000 | 29.40 | 288.6 | L-Head | Block | Left... | Hel'l | Pump... | Splash | Piston... | Dual. | Delco | Auto. | | | | Elec | Delco |
| White, 30 | 4 | 3.750x5.125 | 22.50 | 226.4 | L-Head | Block | Right | Hel'l | Pump... | Spl-Pre | Gear... | Single | Bosch | Hand | Own | Vacuum | Yes | Elec | Entz |
| White, 45 | 4 | 4.250x6.375 | 29.00 | 361.7 | L-Head | Block | Right | Hel'l | Pump... | Spl-Pre | Gear... | Single | Bosch | Hand | Own | Vacuum | Yes | Elec | Entz |
| White, 60 | 6 | 4.250x5.750 | 43.80 | 489.4 | L-Head | Block | Right | Hel'l | Pump... | Spl-Pre | Gear... | Single | Bosch | Hand | Own | Vacuum | Yes | Elec | Entz |
| Willis-Knight, K-19 | 4 | 4.000x5.500 | 25.60 | 251.3 | Knight | Pairs | Sleeve | Chain | Pump... | Pres | Piston... | Single | Simms | Hand | Zenith | Pres | Yes | Elec | U.S.L. |
| Winton, 21 | 6 | 4.500x5.500 | 48.60 | 529.8 | L-Head | Pairs | Right | Hel'l | Pump... | Pres | Piston... | Dual. | Bosch | Hand | Rayfield | Pres | Yes | Opt | |

ABBREVIATIONS:—Valve Location: Side and head, S & H.; Left and right, L & R. Camshaft Drive: Helical gears, Hel'l.; Spur gears, Spur. Cooling Circulation: Thermo-siphon, Thermo. Lubrication System: Splash and pressure, Spl-Pre.; Pressure, Pres. Type of Pump: Flywheel, Flwhl.; Rotary, Rot.; Centrifugal, Cent. Ignition System: Double, Doub.; Two-point, 2-Pt. Ignition Make: Westinghouse, Wathse.; Atwater Kent, At Kent.; Connecticut, Conn. Ignition Control: Automatic, Auto.; Hand and automatic, H&A.; Hand or fixed, H or F. Make of Carburetor: Optional, Opt. Fuel Feed: Pressure-gravity, Pres-Gr. Type of Cranking System: Electric, Elec.; Electric and air, E. & Air. 60-inch tread optional. **Tread more or less than standard except Scripps-Booth, which is optional.

Principal Specifications—Continued

| Lighting System | TRANSMISSION | | | | | | | RUNNING GEAR | | | | CONTROL | | BEARINGS | | | | MAKE AND MODEL | | |
|-----------------|--------------|---------|----------|---------------|-------------|--------------------|-----------|----------------------------|------------|-------|------|---------|--------------|-------------------------|--------------------|-------------------------|---------|----------------|-----------|----------------------|
| | Clutch Type | GEARSET | | | Final Drive | Car Drives Through | Rear Axle | Total Gear Ratio on Direct | Wheel base | TIRES | | Wheels | Rear Springs | Location Steering Wheel | Gearshift Location | Crankshaft Type and No. | Gearset | | Rear Axle | Front Wheel |
| | | Type | Location | Forward Sp'ds | | | | | | Front | Rear | | | | | | | | | |
| | Diak | Sel | | 3 | Bevel | | | | 110 | 29x3 | 29x3 | Wood | Cant. | Left | Cent. | | | | | Peter Pan |
| Wathae | Cone | Sel | Amid | 4 | Bevel | Springs | Semi F. | 3.78-1 | 134 | 36x4 | 36x4 | Wood | Ell. | Right | Right | Plain, 7. | Ball | B&R. | Roll | Pierce-Arrow, 38 |
| Wathae | Cone | Sel | Amid | 4 | Bevel | Springs | Semi F. | 3.53-1 | 142 | 37x5 | 37x5 | Wood | Ell. | Right | Right | Plain, 7. | Ball | B&R. | Roll | Pierce-Arrow, 48 |
| Wathae | Cone | Sel | Amid | 4 | Bevel | Springs | Semi F. | 2.88-1 | 147 | 37x5 | 38x5 | Wood | Ell. | Right | Right | Plain, 7. | Ball | B&R. | Roll | Pierce-Arrow, 66 |
| Wathae | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.00-1 | 126 | 24x4 | 34x4 | Wood | Cant. | Left | Cent. | Plain, 3. | Ball | Ball | Roll | Pilot, 55 |
| Wathae | Cone | Sel | Amid | 3 | Bevel | Springs | Float | 3.60-1 | 132 | 37x4 | 37x4 | Wood | S-E. | Opt. | Cent. | Plain | | Roll | Roll | Pilot, 75 |
| G. & D. | Diak | Sel | Unit M. | 4 | Bevel | Springs | Float | 3.91-1 | 122 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Pratt, 4-40 |
| G. & D. | Diak | Sel | Unit M. | 4 | Bevel | Springs | Float | 3.93-1 | 112 | 36x4 | 36x5 | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Pratt, 6-50 |
| Remy | Diak | Sel | Unit M. | 3 | Bevel | Springs | Float | 3.87-1 | 132 | 36x4 | 36x4 | Wood | S-E. | Left | Cent. | Plain, 4. | Roll | B&R. | Roll | Premier-Weidely, A |
| Spidf-App | Diak | Sel | Unit M. | 3 | Bevel | Tor T. | Float | 4.00-1 | 110 | 30x3 | 30x3 | Wood | Cant. | Left | Cent. | Plain, 3. | Ball | Roll | Ball | Pullman-Junior |
| Wathae | Diak | Sel | Unit M. | 4 | Bevel | Tor Rd. | Float | 3.90-1 | 134 | 36x4 | 36x4 | Wire | Ell. | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Pullman, 6-48 |
| | Diak | Sel | Unit M. | 3 | Bevel | Rad Rd. | Semi F. | 3.75-1 | 96 | 28x3 | 28x3 | Wire | S-E. | Left | Cent. | Plain, 2. | Ball | Ball | Ball | Rayfield, 20 |
| Ward L. | Cone | Sel | Rear A. | 3 | Bevel | Rad Rd. | Semi F. | 4.00-1 | 110 | 32x3 | 32x3 | Wood | Ell. | Opt. | Cent. | Plain, 2. | Plain | Roll | Ball | R-C-H, K |
| Bosch R. | Cone | Sel | Rear A. | 3 | Bevel | Rad Rd. | Float | 3.75-1 | 112 | 32x3 | 32x3 | Wood | S-E. | Opt. | Cent. | Plain, 3. | Roll | Roll | Ball | Regal, D |
| Ward L. | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.00-1 | 105 | 28x3 | 28x3 | Wood | Ell. | Left | Cent. | Plain, 2. | Ball | Ball | Ball | Remington |
| Remy | Diak | Sel | Amid | 3 | Bevel | Springs | Semi F. | 4.00-1 | 115 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Reo, R |
| Remy | Diak | Sel | Amid | 3 | Bevel | Springs | Semi F. | 4.00-1 | 112 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Reo, ST |
| Remy | Diak | Sel | Amid | 3 | Sp Bev | Springs | Float | 3.70-1 | 122 | 34x4 | 34x4 | Wood | S-E. | Left | Cent. | Plain, 4. | Roll | Roll | Roll | Reo, M |
| Delco | Cone | Sel | Amid | 4 | Bevel | Rad Rd. | Float | 4.00-1 | 133 | 36x4 | 36x4 | Wood | Ell. | Left | Cent. | Plain, 4. | Ball | Ball | Ball | Republic, E |
| | Diak | Prog | Rear A. | 2 | Bevel | Tor T. | Semi F. | 4.40-1 | 96** | 28x3 | 28x3 | Wire | Ell. | Left | Cent. | Plain, 2. | Pl&R. | Ball | Ball | Saxon, A |
| | Diak | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 4.50-1 | 112 | | | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Ball | Saxon, B |
| Bijur | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.00-1 | 110** | 30x3 | 30x3 | Wire | Cant. | Left | Cent. | Plain, 2. | Ball | Ball | Ball | Scripps-Booth, C |
| Ward L. | Diak | Sel | Amid | 4 | Bevel | Springs | Semi F. | 4.00-1 | 118 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Ball | Ball | S-G-V, J |
| Bosch R. | Diak | Sel | Amid | 4 | Bevel | Tor T. | Semi F. | 2.75-1 | 137 | 36x4 | 37x5 | Wood | Ell. | Right | Right | Plain, 3. | Ball | Ball | Ball | Simplex, 38 |
| Bosch R. | Diak | Sel | Amid | 4 | Chain | Rad Rd. | Dead | 2.13-1 | 137** | 36x4 | 37x5 | Wood | S-E. | Right | Right | Plain, 3. | Ball | Ball | Ball | Simplex 50 |
| Wathae | Diak | Sel | Unit M. | 4 | Sp Bev | Springs | Float | 3.77-1 | 135 | 36x4 | 36x4 | Opt. | Cant. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Singer, 6 |
| Entz | Cone | Sel | Amid | 3 | Bevel | Springs | Float | 3.75-1 | 120 | 36x4 | 36x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Spaulding |
| Wathae | Diak | Sel | Unit M. | 3 | Sp Bev | Springs | Float | 4.08-1 | 135 | 37x5 | 37x5 | Wood | Ell. | Left | Cent. | Plain, 3. | Roll | Roll | Roll | Speedwell, I |
| Spidf-App | Cone | Sel | Rear A. | 3 | Bevel | Springs | Semi F. | 4.00-1 | 112 | 30x3 | 30x3 | Wood | Cant. | Left | Cent. | Plain, 2. | Roll | Roll | Ball | Sphinx, A-15 |
| G. & D. | Cone | Sel | Unit M. | 3 | Bevel | Springs | Semi F. | 4.00-1 | 119 | 34x4 | 34x4 | Wood | Cant. | Left | Cent. | Plain, 3. | B&R. | B&R. | Roll | Stearns, 4 |
| G. & D. | Diak | Sel | Unit M. | 3 | Bevel | Springs | Float | 3.90-1 | 121 | 36x4 | 36x4 | Wood | Ell. | Left | Cent. | Plain, 5. | Ball | Roll | Roll | Stearns, Big 4 |
| G. & D. | Diak | Sel | Unit M. | 4 | Sp Bev | Springs | Float | 3.50-1 | 140 | 37x5 | 37x5 | Wood | Ell. | Left | Cent. | Plain, 7. | Ball | Roll | Roll | Stearns, 6 |
| Delco | Diak | Prog | Unit M. | 3 | Bevel | Springs | Float | 3.62-1 | 131 | 37x4 | 37x4 | Wood | Ell. | Left | Left | Plain, 4. | Ball | Ball | Ball | Stevens-Duryea, P-6 |
| Delco | Diak | Prog | Unit M. | 3 | Bevel | Springs | Float | 3.62-1 | 138 | 37x5 | 37x5 | Wood | Ell. | Left | Left | Plain, 4. | Ball | Ball | Ball | Stevens-Duryea, DD-6 |
| Wagner | Cone | Sel | Rear A. | 3 | Bevel | Rad Rd. | Float | 4.00-1 | 108* | 33x4 | 33x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Pl&R. | Roll | Roll | Studebaker, 4 SD |
| Wagner | Cone | Sel | Rear A. | 3 | Bevel | Rad Rd. | Float | 3.70-1 | 121 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 4. | Pl&R. | Roll | Roll | Studebaker, 6 |
| Remy | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 4.00-1 | 108 | 32x4 | 32x4 | Wood | S-E. | Right | Right | Plain, 3. | Ball | Ball | Roll | Stutz H.C.S. |
| Remy | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 3.50-1 | 120 | 34x4 | 34x4 | Wood | S-E. | Right | Right | Plain, 3. | Ball | B&R. | Roll | Stutz, 40 |
| Remy | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi E. | 3.50-1 | 130 | 34x4 | 34x4 | Wood | S-E. | Right | Right | Plain, 3. | Ball | B&R. | Roll | Stutz, 40 |
| Remy | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 3.50-1 | 120 | 34x4 | 34x4 | Wood | S-E. | Right | Right | Plain, 3. | Ball | B&R. | Roll | Stutz, 6 |
| Remy | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 3.50-1 | 130 | 34x4 | 34x4 | Wood | S-E. | Right | Right | Plain, 3. | Ball | B&R. | Roll | Stutz, 6 |
| Wathae | Diak | Sel | Unit M. | 4 | Bevel | Tor T. | Float | 3.50-1 | 124 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Ball | Roll | Touraine, 12 |
| Wathae | Diak | Sel | Unit M. | 4 | Bevel | Tor T. | Float | 3.50-1 | 134 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Ball | Roll | Touraine, 12 |
| Ward L. | Cone | Sel | Rear A. | 3 | Bevel | Tor T. | Semi F. | 3.60-1 | 80** | 28x3 | 28x3 | Wire | Cant. | Opt. | Cent. | Plain, 2. | B&R. | B&R. | Ball | Trumbull, 15 A |
| Opt. | Cone | Sel | Rear A. | 3 | Worm | Tor T. | Semi F. | 4.00-1 | 100** | 30x3 | 30x3 | Wire | Cant. | Left | Cent. | Plain, 2. | Ball | Roll | Ball | Twombly |
| G. & D. | Diak | Sel | Amid | 4 | Bevel | Springs | Float | 3.93-1 | 121 | 37x4 | 37x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Velie, 12 |
| G. & D. | Diak | Sel | Amid | 4 | Bevel | Springs | Float | 3.93-1 | 126 | 37x4 | 37x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Velie, 14 |
| G. & D. | Cone | Sel | Unit M. | 4 | Bevel | Springs | Semi F. | 4.08-1 | 124 | 34x4 | 34x4 | Wood | Ell. | Left | Cent. | Plain, 3. | Ball | Roll | Roll | Velie, 15 |
| Hendrix | Diak | Sel | Amid | 3 | Bevel | | Float | | 120 | 32x3 | 32x3 | Wood | Cant. | Left | Cent. | Plain, 3. | Ball | | | Vixen, S-B |
| Wathae | | Fric | Rear A. | | Chain | Springs | None | 4.00-1 | 106** | 28x3 | 28x3 | Wire | Coil | Right | Right | Plain, 2. | Ball | Ball | Ball | Vulcan, 35 |
| Delco | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 4.00-1 | 113* | 33x4 | 33x4 | Wood | Ell. | Left | Cent. | Plain, 3. | B&R. | B&R. | Ball | Westcott, W |
| Delco | Cone | Sel | Unit M. | 3 | Bevel | Springs | Float | 3.77-1 | 125* | 35x4 | 35x4 | Wood | Cant. | Left | Cent. | Plain, 4. | B&R. | Roll | Roll | Westcott, U |
| Entz | Diak | Sel | Amid | 4 | Bevel | Rad Rd. | Float | 3.92-1 | 115 | 32x4 | 32x4 | Wood | Ell. | Left | Cent. | Ball, 2. | Ball | Ball | Ball | White, 30 |
| Entz | Diak | Sel | Amid | 4 | Bevel | Rad Rd. | Float | 3.40-1 | 132 | 36x4 | 36x4 | Wood | Ell. | Left | Cent. | Pl&B, 3. | Ball | Ball | Ball | White, 45 |
| Entz | Diak | Sel | Amid | 4 | Bevel | Rad Rd. | Float | 3.40-1 | 140 | 37x5 | 37x5 | Wood | Ell. | Left | Cent. | Pl&B, 3. | Ball | Ball | Ball | White, 60 |
| U. S. L. | Cone | Sel | Amid | 4 | Bevel | Rad Rd. | Float | 4.83-1 | 120 | 36x4 | 36x4 | Wire | Cant. | Left | Cent. | Plain, 5. | Ball | Ball | Roll | Willys-Knight, K-19 |
| Opt. | Diak | Sel | Amid | 4 | Bevel | Springs | Float | 3.92-1 | 136 | 37x5 | 37x5 | Wood | Ell. | Left | Cent. | Plain, 4. | Ball | Roll | Roll | Winton, 21 |

ABBREVIATIONS:—Make of Cranking System: North East, North-E.; Gray & Davis, G. & D.; Ward Leonard, Ward L.; Bosch-Rushmore, Bosch-R.; Allis-Chalmers, Allis-C.; Leece-Neville, Leece-Nev.; Splidf-App, Splidf-App.; Entz-Dyneto, Entz-Dyn.; Robbins & Meyers, Rob-Myr.; Hendricks, Hendrix. Clutch Type: Contracting band, Con Bd.; Expanding band, Exp Bd. Gearset Type: Selective, Sel.; Progressive, Prog.; Frictional, Fric.; Planetary, Plan. Gearset Location: Unit with motor, Unit M.; Amidships, Amid.; Rear Axle, Rear A. Final Drive: Spiral bevel, Sp Bev. Car Drives Through: Radius rod, Rad Rd.; Torsion tube, Tor T.; Torsion arm, Tor A. Rear Axle: Floating, Float.; Semi-floating, Semi F.; floating, float.; Non-floating, Non-Float. Rear Springs: elliptic, Ell. Elliptic, Ell.; Cantilever, Cant.; Semi-elliptic, Semi E.; Platform, Plat. Control: Center, Cent. Bearings: Roller, Roll.; Ball and roller, B&R.; Plain and ball, Pl&B.; Plain and roller, Pl&R.

Engineering Development - 1915

Block-Cast Motors—L-Head Cylinders—Vacuum Feed Single Ignition—Better Equipment Are on the Roll of Honor for the Year 1915



TRENDS of design are vividly brought out by the announcements for 1915. On this and the following pages a review of the industry and the offerings of the manufacturers is furnished. On the whole the trends of last year are continued, and, in nearly every case, accentuated. The growth of the miniature car with its block-cast motor, its L-head cylinders with thermo-syphon cooling, single ignition, electric lighting and starting and full equipment, is the feature of the year.

¶ Six-cylinder cars have not lost in the percentage tables in spite of the influx of new fours, but although the six retains its popularity, and is used in nearly as many chassis as the four, the car of 1915 has a smaller motor, a longer stroke bore ratio and a smaller piston displacement.

¶ Vacuum feed, the installation of starting and lighting systems on cars of extremely low price, the selling of sizes below \$1,000, the increase in left drive and center control are high spots in the development for the new year. Fine equipment, both in upholstery and mechanical fittings on low-priced cars is another high spot, which the reading of the following short reviews will bring before the mind.

Abbott Design Unaltered

Abbott has the same three cars that were offered last year, these being the 34-40, the smaller of the fours; the 44-50, the large four; and the Belle Isle Model 50-60, which is a six. The prices are unchanged.

The six a 3.75 by 5.25 motor with L cylinders cast in threes employes splash lubrication, Bosch ignition, pressure fuel feed to a Zenith carbureter and electric cranking and lighting. Other details include dry-disk clutch, four-speed gearset in unit with the engine and floating axle of 4 to 1 ratio. Left drive and center control are used, and tires are 35 by 4 1-2 on Firestone demountable rims, although wire wheels are optional.

The larger four, has pair-cast cylinders of L-head form, 4 1-2 by 5 1-2 inches. The gearbox of three speeds is unit with the motor, and drive goes back through a disk clutch to a floating axle of 3 1-2 to 1 reduction. The car has 121-inch wheelbase, gravity feed to a Mayer carbureter, electric cranking and lighting and 36 by 4 1-2 tires on Booth demountable rims.

The smallest Abbott is equipped with a 4 1-8 by 5 1-4 motor of unit power plant type, incorporating gearbox and

dry-plate clutch with it, as do the others. The cylinders are L-heads and cast in block. Like the other car, the fuel feed is by gravity to a Mayer carbureter and two-unit electric starting and lighting are fitted.—Abbott Motor Car Co., Detroit, Mich.

Allen Adds Small Four

Two models instead of one is the Allen offering. This car which had its inception in the 1914 season with a four-cylinder is continued without mechanical changes. It has now been augmented by a smaller chassis also fitted with a four-cylinder model.

On the larger car 35 by 4.5 tires with non-skids in the rear are now used instead of the 34 by 4. Two auxiliary seats have been fitted, making it a seven-passenger instead of five. These seats were furnished last year along with the larger tires at an extra price, but this year they are included in the purchase price. The body has been changed to bring it up-to-date and it is now a streamline form in conformity with standard practice in this particular.

On the smaller chassis a small-bore, long-stroke, 3.625 by 5-inch block cast motor is used. The valves are all on the right side. The motor has an exceedingly short overall length and is part of a unit power plant suspended at three points. The valves are 1.625 inches in diameter and are of cast iron electrically welded to carbon steel stems. The timing gears are helical and have a 1-inch face.

The motor is oiled by a constant-level splash system in which a pump of the plunger type mounted on the outside of the crankcase takes the oil from the reservoir and circulates it to the main bearings and thence to the splash troughs. Starting and lighting is accomplished by a 6-volt electric system which is capable of cranking the engine at 150 revolutions per minute and which can carry the full lamp load when acting as a generator at 12-miles per hour. Ignition is by battery and distributor.

The transmission system consists of a leather cone clutch, a sliding selective gearset providing three forward speeds, and a Weston-Mott floating axle. The control levers which are central and on the right of the driver are mounted directly on the housing of the gearbox. The wheels are 32-inches in diameter and carry 3.5 inch tires. The wheelbase is 110 inches and the rear springs three-quarter elliptic. The rounded radiator and streamline body are in conformity with the latest ideas in carriage work. This model is made in

either touring or roadster bodies.—Allen Motor Co., Fostoria, O.

Apperson Changes Cylinder Design

Two entirely new cars, one a four and the other a six, have been added to the Apperson line. This brings the number of models to four, two fours and two sixes. The new cars are similar in design although the motor dimensions and wheelbases are different. The new four model 4-40, has a 116-inch wheelbase and a 4 by 5 power plant with L-head block cylinders. It sells for \$1,350. The new six at \$1,485 and known as model 6-45 has a 3.5 by 5.125 motor, also L-head cylinders in a single casting.

Both cars incorporate many features of design new to Apperson practice. In the motor the air entering the carbureter is preheated by passing through a core in the cylinder casting. Another unique feature is that the casting which acts as a water outlet at the top of the cylinders, is double. Baffle plates and partitions are so arranged in the water passages on the four that the water flows up on one side and down on the other, giving a complete circulation. On the six the water is conducted along a space on the top of the cylinders until it reaches the rear of the motor where it passes a horizontal partition and flows back to the forward end.

The frame is narrower at the forward end giving a more rigid motor support and also providing a shorter turning radius. Force feed lubrication is continued, but there are independent leads to the camshaft bearings instead of splash.

In the structural work of the chassis, some slight changes will be noted, tending to lightening and simplifying. The transverse shaft which carries the brake and clutch pedals is now only one-half its former length. The rear support of the gearbox is the same as in the past and the drive members from that point back are much the same, except that in the new cars the drive is taken through the springs. The spring hangers are new, being in the case of the rear support integral with the frame gusset plates in the rear and of the strong ribbed section. The torque is taken through the rear springs which are underslung on the two new models. The Bijur lighting and starting system is regular equipment.

No change has been made in the contracting-band clutch

which has formed a part of Apperson construction for several years. There are two universal joints in the drive.

The bodies supplied are of molded design with a rounded V-type radiator fitted with a distinctive shield.—Apperson Bros. Automobile Co., Kokomo, Ind.

Arbenz Improves Equipment

With the exception of such minor details as the shape of the lamps and windshields the Arbenz car will remain the same as for 1914. The line will consist of a four-cylinder chassis upon which two bodies are mounted, one a five-passenger touring and the other a two-passenger roadster.

Both these cars are mounted on a 120-inch wheelbase. The power plant is a 4.125 by 5.5 L-head, with its cylinders cast in pairs. The valves are all located on the left side and are operated by a helical gear driven camshaft. The transverse shaft, across the front end of the motor carries the magneto and water pump. The crankshaft is carried on three main bearings bushed with bronze. A dual system of ignition is used and electric lighting and starting made up of a Diehl motor, a Wells generator and a Philadelphia storage battery. The system operates at 6 volts and the battery has a capacity of 120-ampere hours.

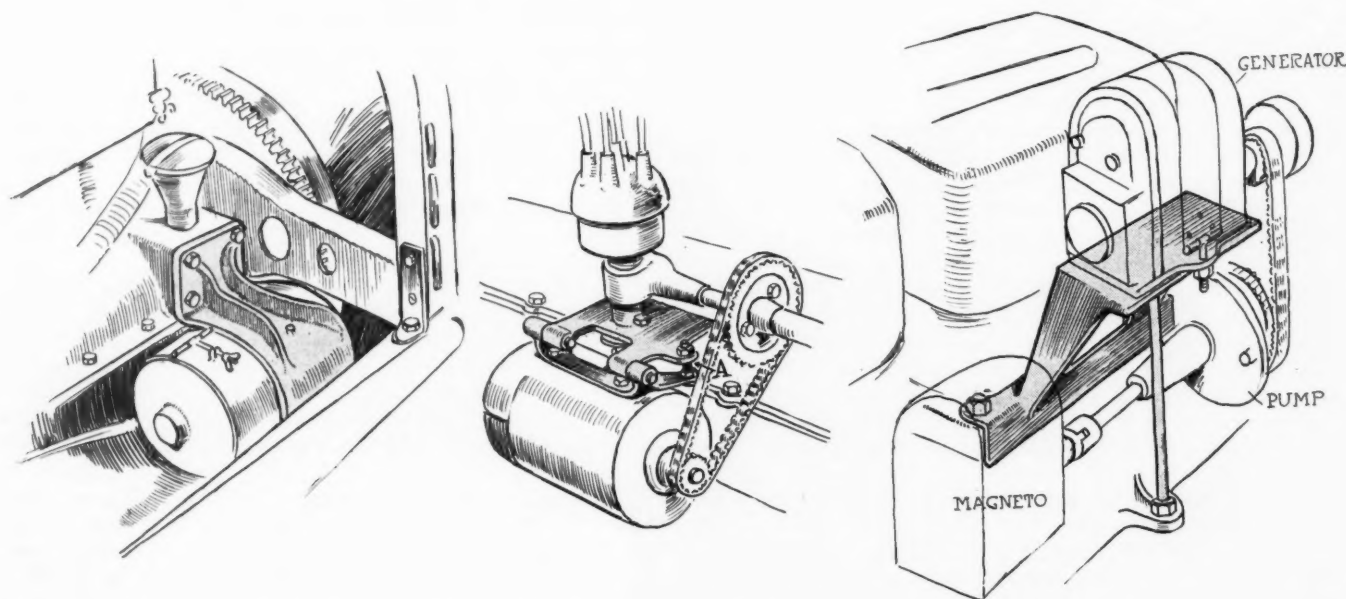
A 15-gallon gasoline tank located under the front seat supplies fuel by gravity to a Schebler carbureter. The transmission system comprises a leather faced cone clutch housed in the flywheel, a three-speed selected gearset carried in a unit with the rear axle and a beveled gear floating rear axle. The tires are 36 by 4 all around fully equipped with demountable rims.—Arbenz Car Co., Chillicothe, Ohio.

Argo a New Light Four

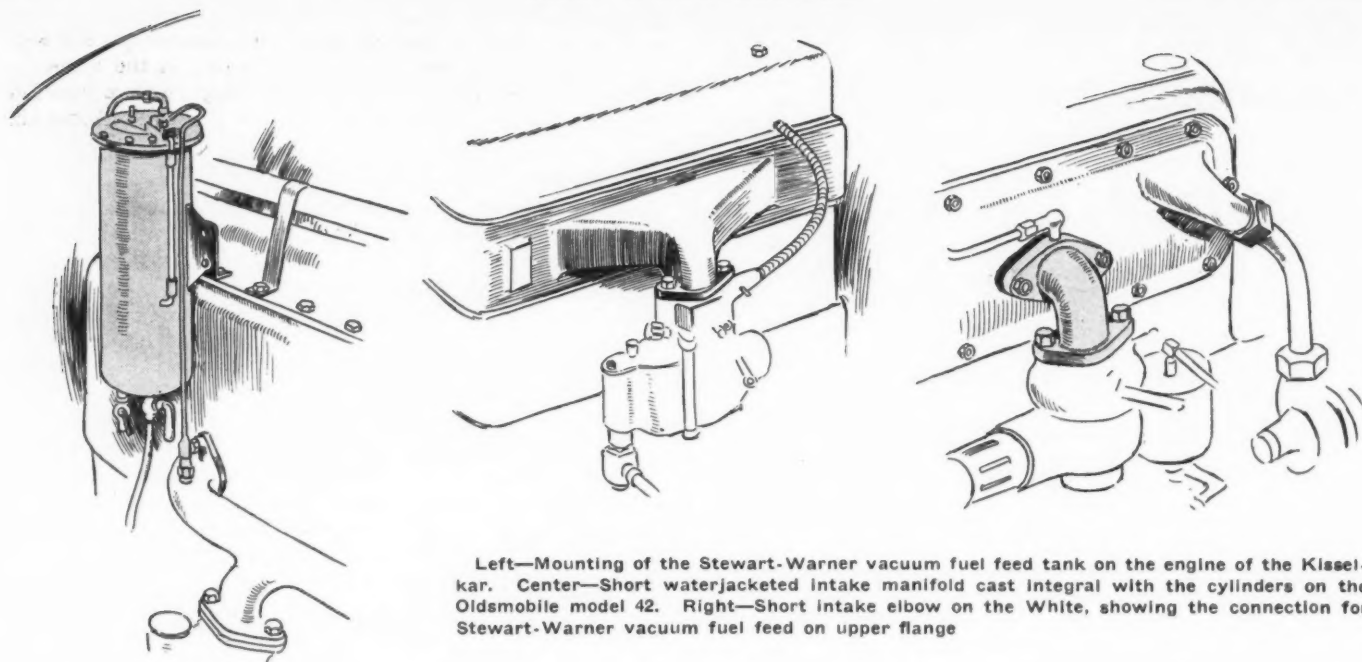
The Argo, a new small car of the year sells for \$295, top and windshield being \$20 extra. It comes as a roadster seating two side by side. The tread is 44 inches and the wheelbase 90.

The motor, a four-cylinder, water-cooled type, has cylinders, 2 5-16 by 4, cast in an L-shaped block. From the motor, drive goes through a cone clutch of internal type and thence to a gearset affording two speeds.

The propeller shaft carries a universal back of the gearbox and then enters a torsion tube which attaches to the



Some methods of mounting electrical units. Left—Showing how the starting motor is hung on a special bracket at the side of the crankcase on the Jeffery six. Center—On the King four-cylinder model the dynamo is suspended on a hinged bracket and provided with a short crank so that adjustment of the chain drive can be made at A. Right—Generator on the Jackson Olympic is mounted on a bracket bolted to the cylinder flange immediately above the magneto and pump shaft. A steel strut to the crankcase gives additional support



Left—Mounting of the Stewart-Warner vacuum fuel feed tank on the engine of the Kisselkar. Center—Short waterjacketed intake manifold cast integral with the cylinders on the Oldsmobile model 42. Right—Short intake elbow on the White, showing the connection for Stewart-Warner vacuum fuel feed on upper flange

axle housing in the usual manner. The rear axle has a ratio of 4 to 1. Elliptic springs are used in front and rear.

Wire wheels with 28-inch tires are fitted, and oil side and tail lamps, horn and tools are included as regular equipment. —Argo Motor Co., 7 East Forty-second street, New York City.

Auburn Reduces Motor Sizes

The Auburn program for 1915 continues the manufacture of a four and a six as during the previous season, but these are so altered that they may really be regarded as new models. In addition, very material price reductions have been made. Model 4-36, the four-cylinder, sells at \$1,075, either as a touring car or roadster, and is \$415 cheaper as a roadster and \$515 as a touring car. Corresponding reductions in the six model 6-40 which now is offered in either body type at \$1,550, have been made, the previous six being a \$2,100 touring car and \$2,000 roadster.

In the six, the 3 3-4 by 5 1-4 engine has given way to a 3 1-2 by 5 1-4, L-head block-cast type with gearset in unit and suspension at three points in the chassis. The four continues to have a T-head motor, but it is a 3 3-4 by 5 in place of the formerly-used 4 1-2 by 5. Like the six, it is a unit power plant with three-point suspension.

Both cars are equipped with electric lighting and cranking, that of the six being provided by a Delco unit, while the four uses Remy apparatus. Carbureters are Rayfields, and fuel feed by the popular Stewart-vacuum system which draws the gasoline from 18-gallon rear tanks on both models. Cone clutches and three-speed selective gearsets are also incorporated in the chassis design.

The steering is on the left and control in the center. There is some difference in the drive features of the two models. The 6-40 has a double-universal open drive shaft with torque arm for drive and torque, and this operates a floating rear axle. In the four-cylinder construction, a three-quarter floating axle gets its power from a shaft having one universal, and drive is through the springs with torque on the universal.

Suspension of the cars is the same, the rear springs being three-quarter elliptic. The six has a wheelbase of 126 inches, and uses 34 by 4 front and rear tires on demountable rims. The four is a 114-inch wheelbased car, and runs on 32 by 4 tires also mounted on demountable rims.

The bodies are brought up to latest design of streamline appearance, and fenders are crowned. These are easily the most attractive cars the maker, the Auburn Automobile Co.,

Auburn, Ind., has ever turned out.—Auburn Automobile Co., Auburn, Indiana.

Austin Uses Double Cantilever

Model 66 Austin, with 4 1-2 by 6, six-cylinder motor and 141-inch wheelbase, is continued with a number of mechanical and body changes and a price reduction from \$4,000 to \$3,600. Touring, close-coupled and roadster bodies are fitted to the chassis, and much weight has been cut from the construction as compared with the 1914 cars.

An innovation is the use of double cantilever rear springs. On either side of the frame there are two light cantilever springs, attached at their centers to the frame bracket and shackling at their front ends to the frame, while the upper one attaches above the axle at the rear and the lower one below it. With this construction, two sets of torsion rods and four driving rods are provided. Easier and softer riding action is claimed for this design, for instead of supporting all the car weight of one side on one stiffer and heavier spring, two lighter springs carry it. The factor of safety is also pointed out to be much greater, because since the car weight is supported at four different points, if any one of the springs should be broken, there would still be three-quarters of the spring capacity on that side. This would be sufficient to continue any drive to its destination, though, of course, more care would have to be taken.

The Austin two-speed axle is used, but it has been redesigned and considerably lightened. One decided point of weight saving is an aluminum housing.

The motor is unchanged. It is a T-head block with a Westinghouse combination cranking, lighting and ignition set. The fuel system embodies a Master carbureter fed from a Stewart vacuum tank, the main reservoir of 25 gallons capacity being amidships under the frame. Other specifications are multiple-disk clutch in oil, left drive, center control of three-speed gear set mounted on the frame, and 34 by 4 1-2 straight side tires.

The close coupled body is new. Placed on the long wheelbase of 141 inches, the passengers are well forward of the axle. Tires and luggage compartments are placed directly over the axle.—Austin Automobile Co., Grand Rapids, Michigan.

Briscoe Remains Unaltered

Originally designed in France and brought to this country about a year ago by Benjamin Briscoe, the Briscoe car is con-

tinued with no change. The prices have been reduced from \$900 to \$785 for both roadster and touring with electric lighting and cranking.

The most distinctive feature is the single headlight in the radiator. Wire wheels, low-hung frame and general sloping of the body to the front aid in giving a light appearance. The wheelbase is 107 inches and tread 56.

The motor 3 1-8 by 5 1-8, of L-head design, has the cylinders and upper part of crankcase cast integrally, and uses detachable heads. The drive of camshaft and magneto is by a silent chain running over sprockets on crankshaft, camshaft and magneto shaft, and at the rear of the cylinders as distinguished from the usual forward location. Another unusual point is the casting together of intake and exhaust manifold, the exhaust gas passages being above the intakes.

The Aplco motor-generator is used for cranking and lighting, being driven through silent chain from the main drive shaft between the clutch and gearbox. The unit is placed to the left of the gearbox, and the ratio between electric unit and its driving shaft is 2 1-2 to 1.

Drive to the rear is through a drive shaft enclosed in a torsion tube, to a floating axle, which has a standard gear ratio of 3 3-4 to 1, with 4 to 1 optional. Semi-elliptic springs are used all around.

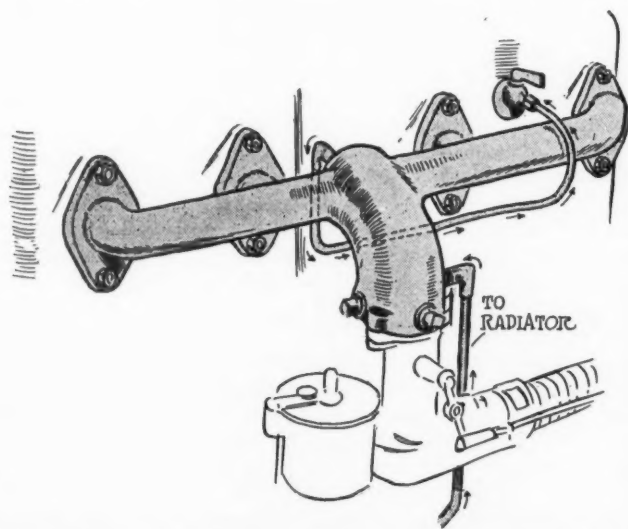
The bodies are well designed, the roadster seating being cover-leaf form, with accommodations for three by placing the center seat a little back of the two side seats. A coupe is designed similarly to the roadster.—Briscoe Motor Car Co., Jackson, Michigan.

Buick Adopts Vacuum Feed

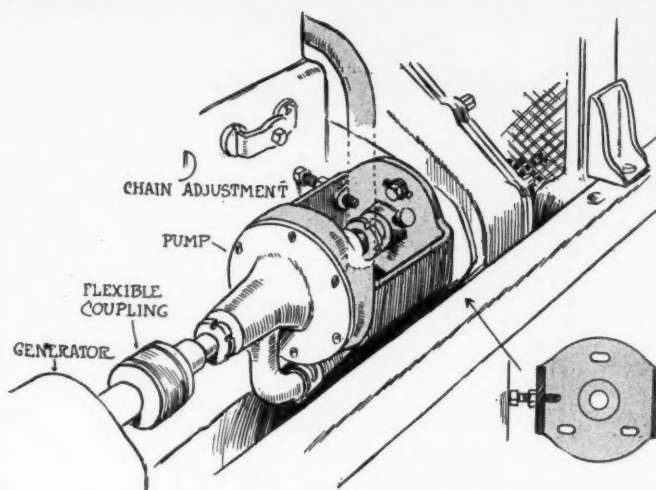
All Buick models are refined continuations. There are six four-cylinders and a six, which are built upon three chassis, and every machine has come in for some price reduction. The largest cut is the six from \$1,985 to \$1,650, while both large four-cylinder touring car, model C-37, and small touring, model C-25, have been reduced \$100 to \$1,235 and \$950, respectively. The two roadsters, models C-36 and C-24, have been each cut \$50, making their present prices \$900 and \$1,185, respectively. On each chassis a roadster and touring body is fitted.

The bodies are all newly designed, and radiators have been rounded at the top. Cowl boards are added to the fours, the six having this feature last season.

All Buicks use the valve-in-the-head motor. The six and the larger fours have 3 3-4 by 5 motors, and the small fours 3 3-4 by 3 3-4. Cylinders are in pairs. Tungsten steel valves have replaced nickel steel ones, and multiple steel piston



Intake manifold on the Willys-Knight, showing the waterjacketed intake elbow



On the Lewis six the water pump is carried on a bracket provided with adjustment for the chain drive by means of a bolt bearing against the side of the crankcase. The insert at the right shows the slots for the holding-down bolts in the base of the bracket

rings are used in place of individual rings in each groove. Pistons are longer to give a greater bearing surface and to eliminate any possibilities of piston slap.

Buicks use the Delco system, and a special feature in connection with it is the complete inclosure of all wires within conduits so that the wiring is now not only more substantially and neatly arranged, but it is proof against all conditions.

On the larger four-cylinder cars and the six, the Stewart vacuum system of gasoline feed is employed, with the vacuum tank located on the intake manifolds. The supply tanks remain at the rear. The small fours do not have this system. Another difference between these smaller cars and the others is that the gearset is not in unit with the motor in the former.

Wheelbase of the small fours has been increased 1 inch to 106 inches; that of the six is 130 and of the other fours 112.—Buick Motor Co., Flint, Michigan.

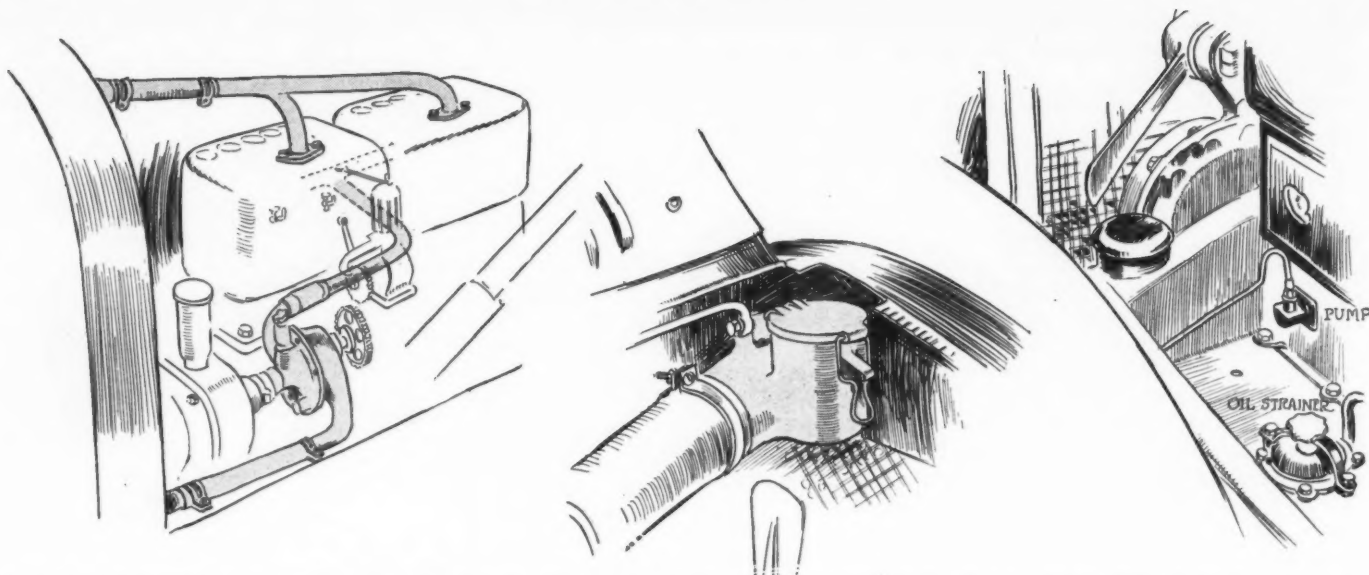
Cadillac Brings Out an Eight

Cadillac has the distinction of being the first American maker to market a motor of eight cylinders, and is equipping its chassis with this type of engine exclusively. In addition to the radical change to a 3 1-8 by 5 1-8, high-speed, V-type eight, the Cadillac chassis has other alterations as follows: The right drive and control have given way to left steer and center control, though the hinged steering wheel is retained. Wheelbase has been lengthened 2 inches to 122 inches, and the gearset, which was formerly located amidships of the chassis, is now made a unit with the motor. A disk clutch has replaced the cone type. In the rear axle, spiral-bevel gears are now fitted in place of the straight bevels used before, this change necessitating much reorganizing of the gear-cutting department of the Cadillac shops, and entailing the expenditure for some complicated machinery for the generation of the new gears.

Delco dual ignition, lighting and starting are still employed, and in most other respects the design is the same as in the past. Outward body appearance is little different than in 1914, though the bonnet, of practically the same length as heretofore, covers twice as many cylinders.

The Cadillac motor, which has created much interest among the motoring public, is said to be slightly lighter than the old four, due to the large reduction in weight of reciprocating parts and to the generous use of aluminum in the crankcase. The power curve shows that the engine develops its maximum of 70 horsepower at 2,400 r.p.m.

In the arrangement of the motor, the two sets of four cylinders are block cast and look like any block of four. They bolt to the crankcase, which is common to both sets,



Left—Water circulating system on the Pullman 6-48. Center—Filler cap under the hood of the Regal. Right—Side of Chalmers engine, showing shelf and accessible location of oil strainer and pressure pump

and their center lines are at an angle of 90 degrees to one another. Only one crankshaft is required, this being the same in design as a four-cylinder motor would use. The two connecting rod ends of opposite cylinders attach to the same bearing, one rod having a yoke end and the other rod going between the arms of this yoke. The two arms of the yoke are pinned to the bushing, which has its bearing against the shaft. The inner rod is free to move on this bushing, having its bearing on the outer surface of the latter. Only one camshaft is required, this being carried on a plate attached to the top of the crankcase. There are only eight cams, one cam operating two opposite valves through rocker arms attached to the same plate as the camshaft. Silent chains drive camshaft and Delco unit shaft, which is vertically above the other shafting and between the two sets of cylinders. At the rear end of the Delco unit are the gears for meshing with the flywheel for starting. The carburetor is also carried between the cylinder blocks, a U-shaped manifold running from it to the castings. An elaborate system of force feed oiling is used, the webs of the crankshaft being drilled and connecting with a supply pipe running along the inside of the crankcase. Another supply pipe carries oil to the camshaft bearings.

Thermostatic regulation of the cooling water temperature is another new thing to motor cars which Cadillac has adopted. By this arrangement, the water in the radiator is cut off when the temperature is low, causing only that in the jackets to circulate until the temperature rises, when a valve automatically opens the radiator supply. When the radiator supply is cut off, the water by-passes through the carburetor jacket, thus heating the carburetor quickly for starting. The temperature of the carburetor water governs the action of the thermostat.

Cadillac offers several closed types of bodies, namely, Sedan, limousine, phaeton, cabriolet and coupe on the regular chassis. These are examples of excellent coach work, and are at prices to correspond to the type of body.—Cadillac Motor Car Co., Detroit, Michigan.

Cartercar Increases Tire Size

Continuing the smaller of the two cars which were marketed for 1914, calling it model 9 instead of model 7, the Cartercar Co. has entered upon a year of one-model concentration. The model 5 of last year has been dropped entirely. This was a larger four.

Roadster and touring bodies have been redesigned and now have the popular sloping hood and cowl with smooth sided

appearance. The friction drive system has had no change in design, though the copper transmission disk has been decreased 1 inch in diameter so as not to make any difference in reduction ratio between motor and rear wheels on account of the fitting of 33 by 4 tires as standard equipment instead of the 32 by 3 1-2 size which were fitted last year. The gear ratio in the rear axle has been lowered from 3.45 to 1 to 4 to 1.

The Cartercar uses a 3 1-2 by 5 four-cylinder Northway block motor, which has a detachable cylinder head. By increasing the clear opening of the valves from 1 11-16 inch to 1 13-16 inch, and by other slight differences in design, the power of the engine is made greater, the developed horsepower being 30 at 1,700 r.p.m. The construction of the engine is of the type with upper half of crankcase cast integrally with the cylinders, the flywheel being unenclosed. It is very similar to the conventional unit power plant construction but without a gearbox.

Delco combination ignition, lighting and cranking is used, the unit being driven off the end of the pumpshaft when a generator, and meshing with flywheel teeth when performing the cranking operation.

In the Cartercar drive system, the drive shaft from the engine connects to the transverse revolving transmission disk, 19 1-4 inches in diameter. Back of this and carried on a jackshaft is a fiber-faced friction wheel which revolves at right angles to the driving disk, and which is 21 1-4-inch diameter. A pedal pulls the driving disk away from the friction wheel so that the latter may be shifted into different positions with relation to the disk so as to give different speed ratios. An enclosed silent chain takes the power back from the jackshaft to the rear axle.

Steering and control are on the right, and wheelbase of model 9 is 106 inches. Equipment is complete, with demountable rims, windshield, top, electric horn, speedometer, tools and so on.—Cartercar Co., Pontiac, Michigan.

Case 5.5 Inches Longer

Continuing its three four-cylinder cars of last season with a number of improvements the Case T. M. Co., Racine, Wis., has reduced the prices of two cars and increased the price of one. The model 25, the leader, lists at \$1,350 instead of \$1,250; the 35 at \$1,600, a drop of \$250; and model 40 at \$1,800, a reduction of \$500.

The 35 and 40 are practically the same as in 1914, but the smaller car, the 25, has a wheelbase of 115 1-2 inches instead of 110, the tires increased from 32 by 4 to 34 by 4, the head-

lights equipped with double bulbs and the spark plug location shifted from the side in the valve plugs to the center of the cylinder casting in holes formerly occupied by the priming cocks. Battery ignition, using the accumulator of the Westinghouse cranking and lighting system, supplants the magneto used formerly. The brakes have been increased from 12 inches diameter to 14.

The Case company has discontinued buying its cylinder castings from an outside source, and for 1915 will do the work themselves. This applies also to the front axle, which is forged in the Case shops.

In the matter of body construction a few changes are noted. The lines have been changed completely in accordance with stream-line ideas, a foot rest is added to the tonneau, and in order to prevent the back of the front seat from becoming scratched a leather covering is provided. The improvement in body lines has allowed of a long cowl formed into a fuel tank, the container in the previous models being under the front seat. The feed, however, still is by gravity. A one-man top now is additional equipment.

The chassis of model 25 includes a four-cylinder, T-head, cast-in-pairs motor, 3 3-4 by 4 3-4, disk clutch and Brown Lipe three-speed gearset. The design of the 35 is the same as the 25; however the motor size is 4 1-4 by 5 1-2. The wheelbase is 120 inches.—J. I. Case T. M. Co., Racine, Wisconsin.

Chevrolet Increases Wheelbase

Two chassis, a four and a six, are offered for this year by the Chevrolet Motor Co., Flint, Mich. On the four, roadster and touring bodies are fitted, while the six carries only the touring type. The six, which is little altered from last year's car, a roomier body of attractive lines being the principal difference, is sold \$50 cheaper than it was, the price now being \$1,425.

With refined body lines bringing out the streamline effect, the fours have an increased wheelbase from 104 to 106 inches, while the brake drums have been enlarged 2 inches to a 12-inch diameter.

The six-cylinder motor is an L-head 3 5-16 by 5 1-4, with cylinders in blocks of three. Thermo-syphon cooling, constant level splash oiling, and Remy dual ignition are features of this power plant. The drive shaft is enclosed in a torsion tube, bolting at its rear end to the gearbox, the latter being in unit with the rear axle, which is three-quarter floating. Other specifications include cone clutch, platform rear spring suspension, left drive, center control and rear gasoline tank feeding by pressure.

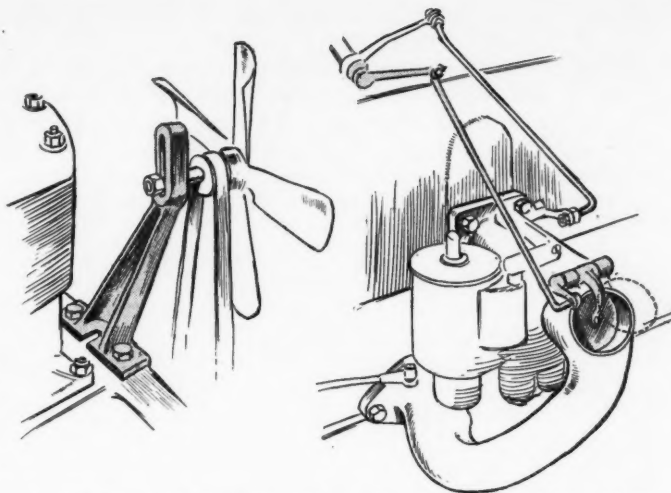
The wheelbase of the six is 112 inches, tires are 34 by 4 and Auto-Lite cranking and lighting are furnished at the price.

The fours have the distinctive Chevrolet motor with valves in the head, rockers and springs enclosed within an aluminum cover plate. Twenty-four horsepower is credited to the engine, whose dimensions are 3 11-16 by 4 inches. The cylinder head is a one-piece casting secured to the cylinder block by bolts, making a compact and readily removable assembly.

Drive is through a cone clutch to a three-speed gearset, located amidships on two frame cross members. Final drive is of the double universal unenclosed shaft type, torque being taken by a rod and drive by the rear springs, which are three-quarter elliptic. Tires are 32 by 3 1-2 on both roadster and touring car. The four-cylinder prices named do not include Auto-Lite electric cranking and lighting. When equipped with it, the price is \$110 extra, five lamps and Prest-O-Lite tank being furnished at the above figures.—Chevrolet Motor Co., Flint, Michigan.

Chalmers Alters Gasoline Feed

Both the 1914 Chalmers sixes are continued this season. A number of detail refinements have been incorporated in both cars, and on the larger of the two, known as the Master



Left—Adjustable fan bracket on the Pullman Junior. Right—Application of vertical-flanged carburetor to Hupmobile. Also the new extra auxiliary air inlet with valve flap operated from dash

Six, a touring body of entirely new design has been fitted. The smaller chassis is known as the Light Six.

In fundamental features the cars are mechanically the same as for the past season, but some minor changes have been made. The cylinder dimensions are the same, but the core work has been altered to give greater water jacket space. The gasoline feed system has been altered to a combination pressure and gravity feed, the gasoline being forced by pressure to a small tank on the dash and thence flowing by gravity. This arrangement has permitted a slight raising of the carburetor, giving better accessibility. The carburetor is now the latest water-jacketed model G Rayfield, and the intake manifold has more water-jacketing space than before. While the multiple disk clutch was used in previous cars it has been improved by alternating bronze and steel disks in place of all steel.

On the smaller six Timken bearings have been added to the front axle. Both axles on the Master Six have been weighted to aid in holding the car on the road. The speedometer drive on both sixes is now the inclosed Empico.

Equipment is now better than ever before. A new design top, which is a product of the Chalmers shops, is fitted, the storage battery is of improved design, better separators being used to eliminate buckling of the plates. A volt meter has been added to the equipment and a Yale lock fitted to the electric switches. On the smaller car the tires are larger, being 34 by 4.5 instead of 34 by 4.

Five bodies are listed on the smaller car and two on the Master Six. The seven-passenger touring car on the Master Six is an innovation in that it is a boat-line design. The price of the Light Six is \$1,650, or \$150 less than in 1914 for the five-passenger car.—Chalmers Motor Co., Detroit, Michigan.

Chandler Lightens Flywheel

Greater power, which is obtained by lightening the flywheel and pistons, and by better balance that admits of higher operative speed, is the feature of the Chandler of 1915. Though the bore and stroke of the engine remain at 3 3-8 by 5 inches, the power increase is said to amount to 10 per cent., the motor having a rating of 35 horsepower.

With this refined motor \$190 has been clipped from the price, it now being \$1,595 for either open car-touring type or roadster. These bodies are much the same in general appearance as they were, having the popular stream lines and sloping hood and sides. Besides these, an attractive line of closed bodies was brought out last fall, all fitted to the same six-cylinder chassis.

The Chandler company makes a strong point of the light

weight of its car. To attain this end, the chassis is simple and parts made as light as possible consistent with their functions. The six cylinders are cast in L-head fashion in blocks of three, and a unit power plant is obtained by bolting the gearset with its center control to the flywheel housing. One change in the engine equipment is the adoption of Rayfield carbureter. Bosch ignition still is used, while a two-unit Westinghouse electric system for cranking and lighting is employed.

The Chandler chassis has a 120-inch wheelbase, and rear spring suspension is of the three-quarter elliptic type. The drive from the motor is by an unclosed shaft fitted with two universals, and paralleled by a torsion arm of pressed steel. When first brought out the car had a torsion arm made of bar stock, but the pressed steel type is lighter.

The rear axle is of floating construction, conventionally designed. Tires are 34 by 4 all around, and demountable rims, in addition to electric horn, Jones speedometer, New Haven 8-day clock, Jiffy curtains and lesser items feature the equipment.—Chandler Motor Car Co., Cleveland, Ohio.

Cole Four Is Smaller

Three chassis, two sixes and a four, make up the Cole line. The four is a revised addition of the four of last season, having the same power plant but a chassis which has been shortened two inches in wheelbase and lightened throughout. At the same time the price of this car has been cut in the touring and roadster bodies from \$1,925 to \$1,485. The big six is the same as for last year in every particular, except that vacuum gasoline feed has been adopted, and the remaining six is a new addition to the line built along the plans of the small sixes which have made their appearance during the past year.

The six-50, which is the added six, has a 3.5 by 5 L-head unit power plant with three-point suspension. The valves are all carried on the left side and are operated from a single integral camshaft driven by helical gears. Both manifolds are separate castings, and the water is circulated by a centrifugal pump.

Lubrication of the motor is accomplished by a non-circulating splash system in which the oil is fed by gravity sufficiently rapidly to replace the lubricant consumed by the engine. The feed is arranged to be proportional to the throttle opening. Ignition, lighting and starting is accomplished by the Delco system, providing a dual ignition outfit, with dynamo, storage battery and dry cells, and a 6-volt lighting and starting system. The battery is an Exide, 120-ampere hour. Vacuum feed takes care of the gasoline, the 15-gallon tank being on the rear end of the chassis. The clutch is a cone within the flywheel, the gearbox a three-speed selective and the rear axle a Timken floating.

The new four, which is changed from the four of last season because it is lighter in weight, has a new streamline body, a Stromberg carbureter, vacuum gasoline feed and a new Timken equipment throughout. It has the 4.25 by 5.25 L-head power plant cast in pairs. The valves are on the left side. Many other features of the chassis are similar in design to the six. The Delco electric system cone clutch, etc., being common but the rear axle is semi-floating. The wheelbase of this car is 120 inches, as compared to 118 inches on the car of last season.—Cole Motor Car Co., Indianapolis, Ind.

Crawford Alters Suspension

But two changes have been made in the Crawford 4-40, which is continued for this season. This is a five-passenger touring model, and the changes have been, first, to alter the suspension of the motor from four-point to three-point, and, second, to divide the front seat in the body to permit the exit of passengers without disturbing the driver, and also allowing passengers to change from the rear to the front

seat without leaving the car. The car will be built with right drive and will be fully equipped with lighting and starting.

In addition to the four, the Crawford company will market a light six, which will be an innovation for this season. It is equipped with a 3.5 by 5 motor, forming part of a unit power plant, a Brown-Lipe gearset and a Timken axle, with a full equipment of roller bearings. The body fitted to this car is of five-passenger capacity, streamline design, and is also provided with the aisle between the front seats as described in the four. This model is left drive and center control, and though a six-cylinder sells for \$250 less than the four, being listed at \$1,850.

The new six, which will be the leader of the line this season, is an adaptation of the up-to-date light-weight six-cylinder car. It has its L-head cylinder cast in a single block and the crankshaft carried on three main bearings. Both the pump and camshafts are driven by helical gears, and the lubrication is by a circulating splash system. For ignition there is a Bosch magneto, and for cooling a centrifugal pump and cellular radiator. The gasoline feed is by vacuum from a 20-gallon tank carried on the rear.

A multiple disk clutch delivers the power to a three-speed gearset, and the rear axle as well as the front are Timken products, fully equipped with tapered roller bearings. The body is of sheet metal over a wood frame.—Crawford Automobile Co., Hagerstown, Md.

Crow Adds a Four

An entirely new four-cylinder car has been added to the Crow line bringing this up to four models, three of which are fours, and one a six. The new car is the smallest of the three and is an entirely new design. The other two fours which are known as E-45 and E-55 are practically the same as for last season except that they are both furnished with streamline bodies and the E-45 now has full electrical equipment. The six is known as E-62.

The new car known as the Crow-Elkhart, Jr. has a 104-inch wheelbase and is provided with a five-passenger body of streamline contour. The motor is a compact design with the 3.125 by 4.5 L-head cylinders cast in a single block and having the crankcase, timing gearcase, water manifold and intake all of aluminum. A steel stamping is used for the bottom pan. The valves are on the left side and are completely inclosed. They have a diameter of 1.125 inch and a lift of .31 inch. The piston rings are a special non-leaking design and the timing gears have a helical pitch. The crankshaft is 1.625 inch in diameter with two bearings, the front having a length of 2.5 inches and the rear 3 inches. The center distances between the bearings are 14.75 inches.

Electric lighting and starting is by the U. S. L. or Huff systems. The generator is located on the left side of the motor and the starting motor on the right. Ignition is by the Connecticut and Briggs system with the distributor mounted on a vertical shaft at the rear of the motor.

A multiple-disk clutch of the dry-plate type in which engagement of the plates is secured by three coil springs, delivers the power to a three-speed gearbox which is integral with the rear axle. The gears and the gearbox are of chrome nickel steel and are carried on New Departure and Hyatt bearings. The rear axle is a floating design having a 2.25 inch housing with a heavy truss-rod. The pinion is a 20-point carbon steel bevel having a ratio of 4.125 to 1. Thirty by 3.5 tires are used on the wood wheels.

The E-45 has a 4 by 5 motor with the L-head cylinders cast in pairs. It has a disk-in-oil clutch, rear axle gearbox and full streamline body. The E-55 differs materially from the E-45 having its four cylinders in a single block. They are 4.25 by 5.5 with the valves on the right. Right drive with center control is used on the Crow models. The price of the Junior is \$725. The six has a 3.75 by 5.5

motor and a 130-inch wheelbase.—Crow Motor Car Co., Elkhart, Ind.

Cunningham Adopts Disk Clutch

One chassis, which is a continuation of the car of last season, will be built by the Cunningham company. In continuing this model a few refinements have been made, one of which has been the substitution of a dry-plate disk clutch for the cone, a simplified brake system eliminating many of the parts of the linkage and a new series of body design.

Cunningham motor is a four-cylinder 4.75 by 5.75 valve-in-the-head. The cylinders are cast in pairs, with a removable head; the manifolds are separate castings. The motor is suspended at four points.

Oil is forced under pressure to the main bearings, but all other bearings surfaces are taken care of by the lubricant which is splashed from the connecting rods. A gear pump takes care of the circulation, bringing the oil from the reservoir which is in the lower half of the crankcase.

Ignition is by a dual system and carburetion by a Stromberg model G 1.5-inch size, with a water-jacketed mixing chamber and a hot-air pipe. Fuel feed is by pressure, the gasoline tank being under the rear end of the frame and having a capacity of 20 gallons. The electric starting and lighting system operates at six volts.

The clutch is a disk having steel to steel friction surfaces and being housed in the flywheel. The gearbox is in a unit with the motor and is of the selective type, having three speeds. A spiral bevel rear drive is used in connection with a floating axle. The wheelbase is 129 inches and the tires 37 by 5.—James Cunningham, Son & Co., Rochester, N. Y.

Cycleplane Continues a Two

Two chassis upon which there are mounted three body styles is the offering of the Cycleplane company. These two models are known, respectively, as the Tourist and Traveler. On the Tourist are two bodies, one a roadster of two-passenger capacity and the other a touring of three. On the Traveler, which is a two-cylinder car, there is only a tandem roadster of two-passenger capacity.

The four-cylinder model has its L-head cylinder cast in a single block. Valves are on the left and covered, providing the neat powerplant common to the block cast design. The two-cylinder model has its cylinders cast singly, one valve being on the left and the other in the head. Cooling on both cars is by thermo-syphon and oiling by splash. The only difference in the oiling systems is that due to the necessities of two and four-cylinder practice. Both pumps are of the plunger variety, circulating the oil to the main bearings and thence to the splash troughs, where it is picked up by the connecting rods. Both cars use single ignition, in the Tourist the make being optional, while in the Traveler the Atwater Kent, with automatic spark advance, is regular equipment.

The Cycleplane company is using its own make of carburetor for the four-cylinder car, while a Schebler motor-cycle model is used on the two-cylinder. A selective gearset with three speeds is used on the four and the two has a planetary gearset with two speeds. Another difference in the drive is that the four is beveled gears while the two uses the chain. The wheelbases are, respectively, 108 and 96 inches, and the tires on the four are 28 by 3 while on the two they are 28 by 2 1-2.—Cycleplane, Westerly, R. I.

Detroit Is Lengthened

While the four-cylinder Briggs-Detroit is fundamentally the same as in 1914, a number of chassis and body improvements are noted. The 3 by 5, L-head, block motor and all the important chassis dimensions remain the same except the wheelbase, which has been increased from 104 to 112 inches. There is an entirely new design of body, in which the use of drop forgings in place of castings for the levers and other

fittings, and a light one-man top greatly reduce the weight.

In appearance the car has been considerably altered, as it has now the round radiator, tapered hood and streamline flush-sided body. A mud shield is added to the bottom of the radiator and the rear appearance changed by removing the bracket from the rear platform spring perch and in its place supporting the spring directly from the rear frame torque member. The springs have had an extra leaf added to them.

It has been found possible to raise the carburetor 4 inches, due to placing the gasoline tank under the cowl. While the motor support is still a three-point scheme, there is now a full cross member to take the rear support and a new type of front member has been fitted which permits the motor to be lifted directly out of the frame. The starting motor bolts directly against the front of the motor, whereas last year it was held on a separate shelf. This year the starting and lighting outfit is a Westinghouse, although operating at the same voltage and with practically the same connection as the previous type.

An innovation is the use of an oil level warning light, which flashes when the oil level in the crankcase drops to a dangerous point.

The bodies are now roomier and 1.5 inches lower than before, the running boards free and the doors widened to 24 inches. The fenders are crowned.—Briggs-Detroit Co., Detroit, Mich.

Dile a New Small Car

Another new car in the low-priced class is the Dile. It is made in one-body type only, a two-passenger roadster, with a four-cylinder 2.625 by 4 block power plant, dry-plate clutch, three-speed gearbox with shaft drive to a semi-floating rear axle. All the transmission parts and axle are mounted on annular ball bearings.

Everything has been done throughout this little car to keep the weight down and at the same time provide ample power and room for the two passengers. The valves are on the right, driven by an integral camshaft, which is operated from the timing gear case by spur gears. Cooling is accomplished by thermo-syphon and lubrication by a plunger pump which is operated from the camshaft. This pump circulates the oil to the main bearings, whence it flows to the splash troughs to meet the connecting rods. The splash takes care of the cylinders, camshaft bearings, etc.

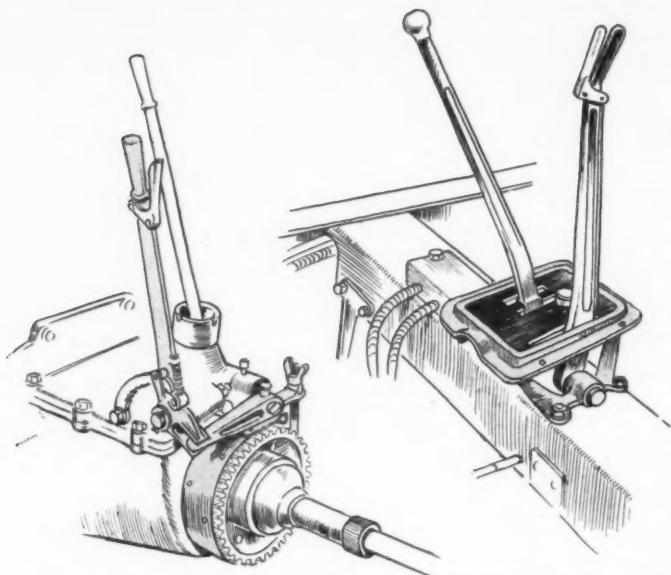
Ignition is by a single magneto system, the Berling high-tension instrument being used with fixed spark. The carburetor is a Holly and the gasoline tank of 5.5-gallons capacity, feeds by gravity from the dash. Electric starting is extra, but a Dyneto generator and Willard-Elba storage battery form part of the lighting equipment.

The dry-disk clutch is housed in the flywheel and has asbestos-against-steel driving faces. The three-speed gearset is selective and is mounted amidships. Control is in the center and the drive is on the left. The wheels are the Houk detachable wire design, and one set of the brakes is located on the rear pinion shaft of the differential and the other internal on the wheeldrum.—Dile Motor Car Co., Reading, Pa.

Dodge Has Improved Gearbox

The Dodge Bros. line was disclosed late in the fall by the announcement of a five-passenger machine of 110-inch wheelbase and equipped with a 3 7-8 by 4 1-2 motor. It can be had only in the one body type.

There is nothing unusual about the mechanical design of the car, although every detail has undergone careful testing before it was decided upon. One point of advantage is the provision in the gearset for shifting the countershaft driving gear out of mesh with the mainshaft gear when the drive is direct so that when the car is in high, the countershaft is not rotating.



Left—Emergency brake behind transmission on Lewis six. The speedometer drive is taken at this point. Right—Mounting of gate for levers on cross-member on the Studebaker

The specifications include the block-cast, L-head motor with gearbox in unit, North East cranking and lighting of single-unit type, Eisemann magneto ignition, cooling by centrifugal pump circulation, separate cylinder head held to the main casting by steel bolts, cone clutch, drive through propeller shaft enclosed in a torsion tube to a floating axle, three-quarter elliptic springs, overslung frame, left drive and center control.

Some of the equipment items are Jones speedometer, one-man top, rain vision and ventilating windshield, Willard battery, and 32 by 3 1-2 tires on demountable rims.

The intake passages are cored in the casting, extending from the single opening to the carburetor on the left to the intake ports on the other side, the cored passages being between cylinders Nos. 2 and 3. The exhaust manifold is a separate casting. The reciprocating parts are of standard design, although the use of thin steel piston rings, three to each ring groove, is specially notable.

The motor is oiled by a circulating splash arrangement, and the motor-generator, mounted on the left forward side of the engine, is of the 12-volt type driving through an enclosed silent chain from the crankshaft with a 3 to 1 reduction.

The floating axle has a pressed steel housing, and mounted on it are the brake shafts and equalizers, allowing the operating rods to run forward centrally of the frame. The latter is well-braced with three cross members, and carries a 15-gallon fuel tank at the rear. The feed is by pressure.—Dodge Bros., Detroit, Mich.

Dorris Adopts Vacuum Feed

One model, a four-cylinder, is the offering of the Dorris company for this season. This car, mounted on a 121-inch wheelbase is a direct continuation of the model marketed last year and is a result of 9 years' development by the Dorris Motor Car Co.

The four-cylinder overhead valve motor has its 4.375 by 5 cylinders cast in pairs. The Dorris dry plate clutch and fan flywheel are continued as features of the unit power plant in connection with the three speed gearbox used last season. Last year the clutch was considerably overhauled by adding a number of plates and using lighter springs. The gearbox remains the same as for the past three seasons with the exception that the levers are in a more accessible position, on account of having been moved forward slightly.

An alteration that is in line with the policy of several

concerns this year, is the adoption of vacuum feed for the gasoline. Last season the gasoline feed was by pressure with the tank placed lengthwise of the chassis at the left side immediately under the body. The filler cap and gasoline gauges were then under the front floor boards. A cut in price from \$2,500 to \$2,200 in the five-passenger touring car body and from \$2,550 to \$2,250 for the seven-passenger touring is another change for this season. In body work an addition to the line is the Sedan. It is mounted on the same 121-inch wheelbase chassis as the other two cars.—Dorris Motor Car Co., St. Louis, Mo.

Empire Is Electrically Started

The same chassis as has distinguished the Empire line for the past 3 years is continued and with the same body as marketed last year for \$900, can now be purchased for \$850. But in addition to model 31-40, a five-passenger touring car has been added. A roadster which corresponds to the new touring car in equipment and general appearance is another addition.

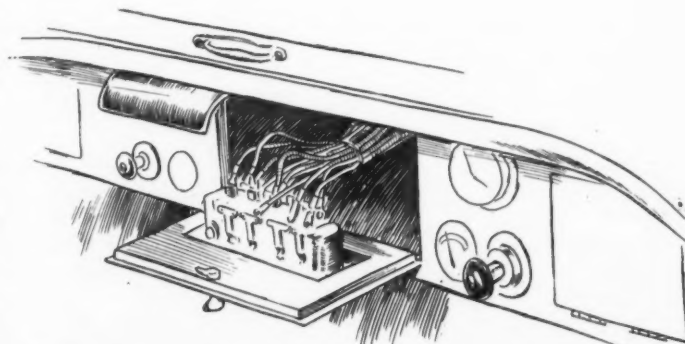
In bringing out the new chassis the most important change outside of the entirely new bodies is the adoption of the Remy lighting, starting and ignition system. The mounting has necessitated some small changes in the motor exterior although all the principal dimensions remain unaltered. The oiling pump is now a horizontal instead of a vertical design and an oil pressure chamber is integral with the pump in order to maintain a steady flow to each of the leads. A priming cup has been mounted on the oil pressure chamber so that in case the car has not been used for some time the proper working of the pump will be insured. Formerly the clutch adjustment was held by a number of steel plungers, but now it is permanently secured by bolts.

The new lighting, starting and ignition system is of special interest in that it is the latest Remy product and is a motor-generator outfit with battery ignition. The cylindrical motor-generator is carried on the forward end of the motor at the right. Its single armature with a compound winding operates 12 volts and performs the functions of the cranking motor and generator. The generator commences to charge at an engine speed of 350 r.p.m. and carries the lamp load at any speed above this with an output of 6 amperes.

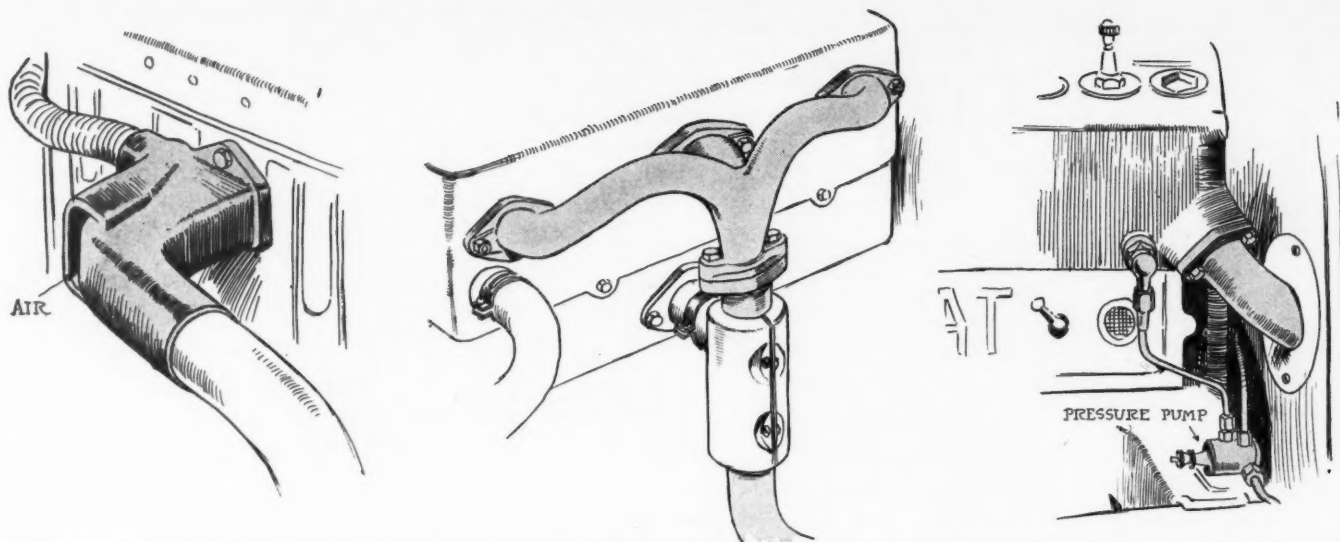
A choice of the touring car which was sold last year, equipped with acetylene lighting, and the new touring car with electric lighting and the streamline roadster is offered. The 3.75 by 4.5 power plants are used on all cars.—Empire Automobile Co., Indianapolis, Ind.

Enger a Unit Power Plant

A six-cylinder chassis with 124-inch wheelbase is the offering of the Enger Motor Car Co. On this is fitted a streamline body with a six- or seven-passenger capacity and clean cut exterior without any luggage being carried upon the running board.



Hinged switchboard on dash of Locomobile Small Four, which exposes all connections in accessible position



Left—Hot-air intake cast integral with exhaust elbow on Chevrolet. Center—Special shaped exhaust manifold on new Hupmobile, showing hot-air stove on exhaust pipe. Right—Short exhaust elbow and location of pressure pump on Fiat

The Continental L-head block power plant is used. The valves are on the right, together with the pump and generator shaft from which the Atwater-Kent distributor is driven by a bevel gear. On the right side of the motor is the carbureter and cranking motor which engages with teeth on the flywheel. The carbureter is fitted with a dash adjustment for easy starting and is water-jacketed. The oil breather and filler opening is also on this side of the motor, and there is also a gauge for determining the oil level.

Connection between the motor and gearset is made through a multiple disk clutch housed in the flywheel which is inclosed in a bell-shaped extension of the crankcase to which is bolted the gearbox. Three speeds are provided by the gearset, the lever being mounted directly on the top of the housing in accordance with general practice for central control. Two universal joints are used in the drive and no torque or radius rods are provided, the functions of these being performed by the spring. In order to stiffen the springs sufficiently for their dual service in suspension and torque transmission the main leaves are constructed from vanadium steel.

In body work the streamline form has been adhered to. The seating arrangement is provided by the ordinary front and tonneau seats with two auxiliary seats which fold in the rear. The slope of the cowl is unbroken as the side lights are not used. A dimming arrangement in the head lamps provides signal lights.—Enger Motor Car Co., Cincinnati, Ohio.

Fiat Alters Bodies Only

The only changes made in the Fiat car are those affecting the body style. The cowl will have a greater curvature making a small dash which harmonizes with the general lines of the car. Multiple bulb headlamps will be used, eliminating the side lamps.

There are three models of Fiat known respectively as 54, 55, 56. The first two of these are four-cylinder types and the third is a six. The Fiat design is distinguished by the fact that the motors are all of the block type, even the six having a very short overall length. The Fiat company manufactures on the metric system and consequently the bore and strokes of their motors are in millimeters but translated to inches are 4.4 by 6 and 5.12 by 6.75 for the fours and the six has the same bore and stroke as the smaller four.

The cylinders are all L-head carrying the valves on the left side. The manifolds are cast integrally with the cylinders, the result being a motor of small dimensions and clean

exterior appearance. Helical gears are used on all the models to drive the camshaft while the magneto, water pump, etc., are operated from a transverse shaft.

Pressure feed lubrication is used, the oil being circulated by a gear pump. Water circulation is maintained by a centrifugal pump, the remaining part of the cooling system being made up by ample waterjackets in connection with a honeycomb radiator. The fan is formed by the pitched blades of the flywheel.

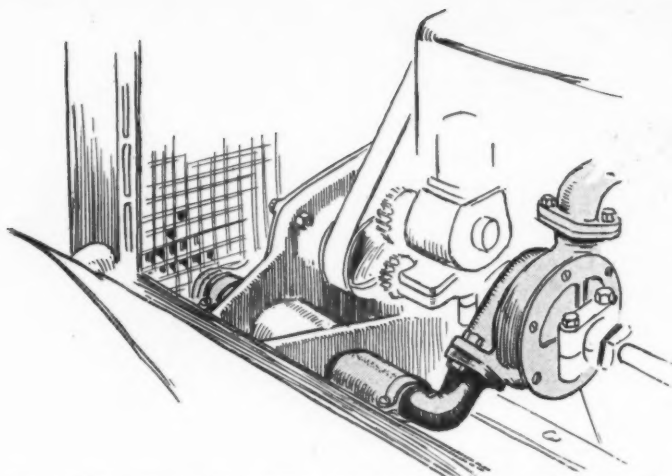
Ignition is accomplished by the Bosch dual system and starting and lighting by Westinghouse in connection with a Willard storage battery. In transmitting the drive disk-in-oil clutches are used, the friction faces being steel to steel and the housing being within the flywheel. All models have four-speed gearboxes with direct on fourth and all have a rather high gear ratio, the lowest being in the six, where a ratio of 3.06 to 1 is used. A feature of Fiat construction is the pressed steel rear axle housing which eliminates both radius and torque rods, being continuous to a forked yoke which connects with the gearbox.—Fiat Automobile Co., Poughkeepsie, N. Y.

Firestone-Columbus Drops Four

One four and one six are listed by Firestone-Columbus this season. The larger four of last year, which was only fitted on a raceabout body, has been discontinued. The bore and stroke of the four and six which are made for this season are the same, being 4.125 by 5.25. The four-cylinder motor has the cylinders cast in a single block while on the six they are in two groups of threes. Both have L-heads with the valves on the left side.

Last season, only the six-cylinder model was equipped with the Gray & Davis lighting and starting system but this year the four has also been fitted with it. A difference in the electrical equipment, however, which has been maintained, is in the ignition. On the four, the Splitdorf Dual system is employed, while on the six, the Connecticut outfit forms a part of the double system. The carbureter on the four is a Schebler while on the six it is a Rayfield. The Schebler carbureter is not equipped with hot-air pipe while on the Rayfield this equipment is used. The feed of gasoline is accomplished by gravity on both models.

Differences between the construction of the four and six are noticeable also throughout the drive, while the four has a cone clutch, amidship gearbox, without the unit power plant feature, the six has a disk clutch and a unit power plant in which the three-speed gearbox is incorporated in the same housing as the clutch. This being a bell-shaped casing



The rubber connection between the pump and the radiator on the National six passes through a hole cast in the crankcase arm

which is a continuation of the crankcase. Both the six and four have bevel final drive to a floating axle. The wheelbases of the two cars are respectively 116 and 132 for the four and six and the tires 34 by 4 and 36 by 4.5. The six-cylinder car has smaller tires in the front than in the rear, 36 by 4 serving for this purpose.

In body work the four is made up in a roadster and touring while the six can be had in either five-passenger touring or seven-passenger touring.—Columbus Buggy Co., Columbus, O.

Ford Adds Two New Bodies

Ford continues the familiar model T chassis, although bodies have been redesigned. Last October, two new body types were added, a coupélet and a sedan, swelling the line to five types. The others are the roadster, touring car and the town car.

The coupélet may have the top folded back when weather permits, but it may also be closed so that no water or snow can get in. It is then virtually a coupé. The upholstery is deep and windows wide in sliding sash. The sedan has two wide doors, and provides seating for five, three in the rear seat and two in front on individual chair type seats. The right hand seat is on a pivot and folds back out of the way. Wide window panels make for clear vision in all directions.

The model T chassis with 100-inch wheelbase carries a 3 3-4 by 4, block, L-head motor cooled by thermo-syphon. This engine is three-point suspended in the frame, and a feature is the flywheel magneto, which provides the ignition current. Planetary transmission is employed which gives two forward speeds and reverse. The drive shaft is enclosed with a torsion tube which is a unit with the rear axle housing. The clutch is a steel disk design, brakes are on transmission and rear wheels, the former being the service set. Semi-elliptic cross springs are used front and rear, shackling at their ends to the axles. The front tires are 30 by 3, and the rear 30 by 3 1-2.—Ford Motor Co., Detroit, Mich.

Franklin Adopts Spiral Bevel

Franklin prices are reduced. On the touring car at \$2,150, \$150 has been taken off and a similar amount from that of the roadster, while on the closed cars a still greater reduction has been made, \$200 in the Berlin and Sedan and \$350 on the coupé.

Mechanically only one change is made on the motor and that in the fitting of the oil adjustment on the cowl board instead of under the hood. In the starting and lighting system better accessibility is obtained and by an improvement in the Dyneto commutator and brushes; this system weighs 40 pounds less than formerly. In the rear axle spiral bevel

gears have been adopted in place of the straight bevel. A number of small details such as the spring pivot bolts, the front springs, magneto attachment, etc., have been revamped. The magneto is now attached by two dowel pins, and a divided metal strap over the top in place of the bolted-on brackets. In the front spring the deflection was 1 inch to 180 pounds, it is now 1 inch to 200 pounds. In the spring pivot bolts a new bushing has been employed which incorporates a felt washer intended to keep the dirt out and the oil in.

Better equipment at the lower price is the result of increased production efficiency in the Franklin plant. This season either the Goodrich Silvertown cord tires, or the Goodyear Power-Saver cord type are offered as regular equipment. The Hartford single-cylinder tire pump is fitted. This, together with the bracket which supports it, weighs 6.5 pounds. By the use of this pump the Franklin company claims to have removed the reason for the heavier type of demountable rim and now substitutes the Q. D. type.

In body work the front doors are wider and set back a little to permit of easier entrance. Mud guards are wider and the rivets are invisible. Side lights have been eliminated. The Franklin is one of the few cars which fits a luggage carrier as regular equipment.—H. H. Franklin Mfg. Co., Syracuse, N. Y.

F. R. P. a High-Speed Design

A new speed creation has been brought out under the name of F. R. P., by Finley R. Porter, ex-chief engineer, of the Mercer company. It is made up only in chassis form and without a body sells for \$5,000. The chassis is a study in the use of alloy steel. The 4.6 by 6.75 I-head motor is fitted with camshafts, crankshafts and connecting rods of hollow chrome vanadium steel and throughout the car this alloy has been employed to give the utmost lightness with the greatest possible strength. Magnalium, an aluminum-magnesium alloy has been employed for housings.

The motor is a different design from any heretofore employed in American practice. It has its four cylinders cast in a block and is provided with an overhead camshaft which is driven by a worm and vertical shaft at the front end of the motor. The valves are the 45-degree poppet type, but are so formed that when they are closed the combustion chamber is practically a hemisphere. In every other particular, with the exception of double, 80-pound valve spring, the design does not depart from ordinary valve-in-head practice to any marked degree.

An unusual oil pump which has a capacity of 30 pounds at 1,500 r.p.m. and which has an ultimate capacity of 600 pounds is used. The pump is a rotary piston design operated by two cams located at the bottom end of the vertical shaft which drives the camshaft.

The clutch is a cone housed within the flywheel. The latter is 21 inches in diameter and is a steel forging providing a clutch surface 19 inches in diameter and 2.5 inches face width. There is a compensating joint between the clutch and the gearbox which provides four speeds. The shaft is a hollow member and takes the drive through two universal joints to a bevel gear differential. Chrome vanadium gears are used here and the driving stress is transmitted through the springs.

For service purposes there is a brake on the shaft and the emergency is carried on the rear wheels. The steering gear is a worm and full gear with a magnalium housing a 2-inch post. The complete electric equipment is made by Bosch and the wheelbase is optional to suit the style of body ordered.—Finley Robinson Porter Co., Port Jefferson, L. I.

Glide Has Dash Control

The four-cylinder Glide has received changes affecting the body, carbureter, clutch, brakes, windshield and carbureter

air control. The tonneau seat has been made wider and the braking system entirely redesigned. It now consists of a two-piece, brake-operating shaft extending from one drum to the other and being split near the middle, the abutting ends each having an operating lever. The two levers are clamped together and one of them is connected by a rod to the brake pedal. This system is said to give the advantages of brake equalizers and preventing one brake from refusing to work at the same time giving simultaneous adjustment.

A knurled button in the center of the steering wheel forms the carburetor air control, and another feature of this control is that when pressed it operates an electric horn. The windshield brackets are built into the body. The most important chassis change is the substitution of a disk clutch for the cone formerly used. The motor is a four-cylinder 3 1-2 by 5, block thermo-syphon cooled and fitted with Westinghouse ignition, cranking and lighting system. The wheelbase is 114 inches.

Top side sway has been banished by the new windshield mounting the brackets of which are built into the body. These brackets have attached to them arms which in turn carry conical supporting lugs, which form the connection to the windshield metal frame. The top brackets are attached to eyes on the side arms.—Bartholomew Co., Peoria, Ill.

Grant Adds a Six

A six at \$795 is the offering of the Grant company for this season. In addition to this the four-cylinder model has been improved and continued.

The six which will be the leader has a 106-inch wheelbase, standard tread and is equipped with a 2.875 by 4.25 inch block motor. Other specifications are a three-speed gearset, floating rear axle, left drive, center control, cone clutch, cantilever rear spring suspension, unit electric motor generator for lighting and cranking and cowl gasoline tank. The price mentioned is inclusive, but if it is desired a car can be had for \$45 less without electric cranking and lighting. In this case acetylene lamps are fitted. The body is a five-passenger touring type with boat lines, having a sheered gunwale. The power plant of the six is a unit and the valves are in the heads of the cylinders. The motor is cooled by the thermo-syphon system and lubricated by a combination splash and pressure system in which the oil is circulated by a gear pump. Ignition is accomplished by means of current taken from the storage battery and distributed by the Atwater-Kent system with automatic advance.

The four has a 2.75 by 4 L-head block power plant with the valves on the left. It is also cooled by the thermo-syphon system and oiled by splash with a vacuum feed. A single ignition system is used in which the current is furnished by a Swiss magneto with hand spark control. The carburetor is a Mayer fed by gravity. The electric lighting and starting system is the Allis-Chalmers. A cone clutch is used in connection with a progressive two-speed gearbox on the rear axle. The axle itself is three-quarter floating and the drive is taken through a torsion tube and radius rod. The wheel-

base is 90 inches, the wheels wire and the tires 28 by 3 clinchers. This model is only made up in a roadster body.—Grant Motor Co., Detroit, Mich.

Great Eagle to Order

The Great Eagle six-cylinder cars are made-to-order propositions, most of the inclosed cars being of large carrying capacity. A ten-passenger limousine is a feature of the line.—United States Carriage Co., Columbus, O.

Haynes Has New Six

There is a new Haynes six with 121-inch wheelbase for three smaller bodies and a 127-inch wheelbase for the seven-passenger body. There is also a larger six and a four which are continued models.

The new six is quite different from other Haynes cars. The electric method of gear shifting used in 1914 is not employed. The vacuum feed for gasoline is used. A motor-driven tire pump has been added and in body work there has been considerable change to conform to the latest dictates of streamline fashion. The radiator has rounded edges and the hood tapers slightly to the cowl. The lines of the body are horizontal from the center of the front door to the rear with no upholstery visible above the top line, but instead the body sides are topped with strips of polished wood. The long straight body lines give a racy appearance, which is assisted by underslinging the springs and lowering the car.

The motor, a block casting 3.5 by 5, is a part of a unit power plant, with the valves inclosed and clean exterior appearance a feature. Hot air intake is fitted to the Rayfield carburetor and the Stewart vacuum tank is mounted on the dash with the gasoline tank carried on the rear between the frame members.

The big six 4.25 by 5.5 with L-head cylinders cast in pairs, has the motor supported at four points and lubricated by a circulating splash system using a plunger pump in the lower part of the crankcase. Ignition is by a Simms high-tension, dual system and starting and lighting are provided by a Leece-Neville system in connection with a Willard battery. The contracting band clutch and three-speed gearset are used in conjunction with a floating axle.

The four, similar in dimensions and detail to the big six, has a 4.25 by 5.5 L-head motor, with cylinders in pairs, and uses the same lubrication, ignition and carburetion system as the larger car. The clutch and running gear are also the same. The wheelbase is 118 inches as compared with 130 inches on the big six.—Haynes Automobile Co., Kokomo, Ind.

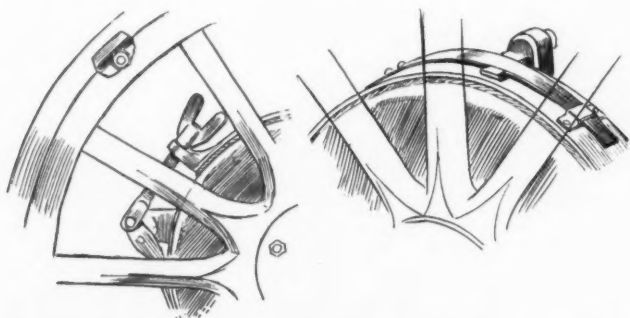
Herff-Brooks New Bodies

The Herff-Brooks company is turning out two models, a four and a six, both with new streamline bodies, folding down steering wheel hinged so that the driver may enter or leave the car without wheel interference, Stromberg carburetor, right drive and center control instead of left and center. Bosch ignition instead of magneto and dry cells. Apelco cranking and lighting is new and a one-man top is substituted for the regular type. The five-passenger models now have an extra folding seat for a sixth person, which, when not used is placed in a tool box under the front seat.

Aside from these changes the four has had the wheelbase increased from 116 to 118 inches and the motor bore 3-8 inch to 4 1-2.

The six motor is an L-head with separately cast cylinders 4 by 4 1-2. This method of casting calls for a rather long crankshaft and hence more than the usual number of supports. In this engine seven bearings are used. Power transmission is through an inverted-cone clutch equipped with a brake to a three-speed gearset redesigned slightly to care for the central control.

The four-cylinder car has a larger motor and the cy-



Left—Accessible brake adjustment on the Dodge Bros. car. Right—Light spring to hold brake band off brake drum on the Chevrolet

linders are block cast, L-head design and equipped with same accessories as the six.—Herff-Brooks Corp., Indianapolis, Ind.

Herreshoff Narrow Tread

The Herreshoff of this season is an entirely new product and put out by an entirely different concern than the Herreshoff of last year. Although the Herreshoff Light Car Co., the maker, is an outgrowth of the former Herreshoff Motor Co., the two cars are entirely distinct. The Herreshoff for this season is built only in a roadster form on a 94-inch wheelbase with a 44-inch tread. It has a four-cylinder block power plant with 2.375 by 3.25 cylinders. The valves are on the right side of the cylinder casting and are inclosed by side plates.

Everything about the car corresponds to the practice used in the manufacture of larger cars and the equipment is complete in every respect. Cooling is taken care of by a thermosiphon system without a fan. Lubrication is by combination pressure feed and splash and ignition by the Atwater Kent system with automatic distributor.

Gasoline is fed by gravity from the four-gallon tank located beneath the cowl to a Carter carbureter. A complete Entz-Dyneto starting and lighting system in connection with a Willard 80-ampere-hour battery is part of the standard equipment.

The three-speed gearbox is located amidship and the drive is taken through a semi-floating axle. The wheels are wire, with clincher rims and quarter elliptic springs are used all around.—Herreshoff Light Car Co., Troy, N. Y.

Hudson Stiffens Crankshaft

Hudson has two sixes, the leader designated as model six-40, having a number of refinements principally in motor and chassis and being reduced in price from \$1,750 to \$1,550, and the larger model six-54, which is but little changed.

The general mechanical layout of the six-40 and the outward appearance are practically the same as last season, although several detail changes have been effected, such as the use of a single casting for the six cylinders, instead of their being cast in groups of three. This makes it possible to eliminate an external intake manifold, the gas distribution from the carbureter being by cored passages in the cylinder casting. Due to finer balance of reciprocating parts and to an increase of 1-8 inch to the crankshaft diameter, the horsepower has been augmented, it ranging from 40 to 47, this attained by the resultant smoother running action.

The dimensions of the motor are of the popular 3 1-2 by 5 size, and L-head construction with gearset in unit is used. In the cooling system a more efficient type of radiator is employed, while automatic spark advance has been added to the hand lever advance. This is an improvement which is made in the combination Delco unit which supplies current for lights, and takes care of cranking as well as ignition.

In the six-40 chassis, the principal refinements are the replacing of a solid tapered driveshaft by a tubular type of uniform cross section throughout; by the use of self-lubricating bushings in the steering connections, brake shafts and steering column tube, making attention to them practically unnecessary; and by the lightening of the weight of the cowl gasoline tank by making the fittings of pressed steel instead of cast iron.

Other chassis features of the six-40 are the Hotchkiss drive through the rear springs, the tapered frame, which gives good body support and the speedometer drive from the propeller shaft. The car has 123-inch wheelbase with left drive and center control.

The six-54 has much the same appearance as the smaller six, though on a somewhat larger scale. The motor is a 4 1-8 by 5 1-4, of L-head type, with cylinders in threes. Delco combination electrical system is also used, while a four-speed

gearset with direct on third still features the car. The drive shaft is of the double universal type, but a torsion arm takes drive and torque. The frame tapers as does the six-40, and left drive with center control are provided. The cowl gasoline tank is also used. Wheelbase is 135 inches.

An attractive line of closed bodies is supplied for either chassis.—Hudson Motor Car Co., Detroit, Mich.

Hupmobile Changes Design

An entirely new car is now being marketed by the Hupp Motor Car Co. The design of 1914 has been entirely displaced by it. The new model is a larger and more powerful design embodying among other features new to the Hupp company left drive and center control. The wheelbase is 13 inches longer than the previous one, being 119 inches. The bore is 1-8 inch larger giving a 3.375 by 5.5 power plant with larger water jackets, valves, connecting rods, bearings, ports and manifolds. The Zenith carbureter is still used but instead of the vertical type a horizontal design, 1-4 inch larger is fitted. The carbureter size is now 1.25 inches.

While the Westinghouse outfit is still used it is a single unit instead of a double unit system. The magneto has been dropped and in its place the Atwater Kent distributor substituted. With the fitting of the new distributor many exterior features of the motor have been altered. A new fan bracket with a tension coil spring is an example.

In rearranging the motor the drive of the camshaft has been moved back to accommodate the new position of the carbureter and while the oiling system has not been altered so far as the motor is concerned it is now arranged so that it does not feed to the gearbox, the object being to use a heavier lubricant at this point.

The clutch is the same in principle as in the last model but has been completely reversed, the purpose being to put the thrust drag on the gearbox rather than on the motor when slipping the clutch. The diameter of the clutch remains the same at 13 inches, but the number of plates has been increased by four. There are now 13. Just back of the clutch is a new chassis frame member which acts as stiffener and carries the pedal shaft. The entire rear axle is new and the body larger with streamline form. The spring suspension is now semi-elliptic all around instead of the cross rear spring.—Hupp Motor Car Co., Detroit, Mich.

Imperial Uses Cowl Tank

The Imperials are three in number—two sixes and a four. The four has a 115-inch wheelbase and 3 3-4 by 5 Continental, L-head block motor rated at 22.5 S. A. E. horsepower. Gray & Davis cranking and lighting, thermo-siphon cooling, cowl fuel tank and streamline body with sloping bonnet and rounded-top radiator are other features. The cowl fuel tank is new to Imperial practice. Ignition is by Atwater-Kent Unisparker. The gearset forms a unit with the engine, and drive is through multiple steel-disk clutch and unclosed driveshaft with two universals. This latter is a departure from preceding Imperial four-cylinder practice, the shafts being heretofore in torsion tubes. The rear axle is floating and 12-inch brake drums are a part of the unit.

In the new six, Imperial has brought out a car of exceedingly trim lines. Mounted on a 130-inch wheelbase, the car is driven by a 3 3-4 by 5 1-4 Continental unit power plant, with cylinders in threes, and valves on the right. Centrifugal pump cooling, North-East cranking and lighting are used. The clutch is a disk type and drive is through a shaft enclosed within a torsion tube. The rear axle is floating, its brake diameter 16 inches and the drive ratio 3 7-8 to 1. The fittings include 36 by 4 1-2 tires, and Stewart vacuum fuel feed from 20-gallon rear tank.

The other six, model 44, carries the same motor and has practically the same drive features. Its wheelbase is 126 inches, and the five-passenger body is somewhat similar to

that mounted on the other six chassis. This car also has North-East cranking and lighting, carries complete equipment and uses 36 by 4 1-2 tires.—Imperial Automobile Co., Jackson, Mich.

Inter-State Builds a Four

Inter-State is marketing a four-cylinder chassis with a touring body. This is one of the concerns which has turned its attention to touring bodies alone and makes roadsters only in sufficient quantities to meet orders. This is an entirely new model for this season. It has its 3.5 by 5 cylinders cast in single block and in place of the L-head design used on the six, marketed last year, now has the valve in the head.

Last year's six had 3 by 5 cylinders, but this concern is among those who have pinned their faith to the smaller fours this season. In fact the motor has a number of tendencies toward what is becoming average American practice. The bore and stroke are almost identical with the average of the dimensions of all American cars. Thermo-syphon cooling is used. This is another change from the methods used on the six, as this had pump circulation.

Another change is in the ignition system, which is now single instead of the double type used previously. Lighting and starting is by electricity, but the manufacturer of this has not as yet been announced.

While a disk clutch was used for the six, a cone clutch delivers the power to the gearset in the four. A complete change in the rear construction and transmission system has been made. While in the six a unit power plant was employed, and the gearbox four forward speeds, a cone clutch is used in the four and the three-speed gearbox is incorporated with the rear axle. Instead of the drive being taken through the springs it is now through a torque tube. The rear axle is three-quarter floating whereas in the six it was floating. The wheelbase of the new car is 110 inches and is fitted with 33 by 4 tires. The six had a wheelbase of 132 inches with 36 by 4.5 tires.—Inter-State Automobile Co., Muncie, Ind.

Jackson Drops a Four

The three-model policy which the Jackson company adhered to in 1914 has given way to greater concentration, in that there are now only two models, a four and a six. The new cars cannot be regarded as continuations of any older models, so different are they mechanically.

As compared with the Olympic of 1914, the new car bearing that name has a 2-inch longer wheelbase, 117 inches. Its motor is also larger, being a 4 1-2 by 5 1-4, whereas the old one was 4 1-8 by 4 3-4. The L-head cylinders are in pairs and gearbox is in unit. Instead of having gearshift and control levers on the left, as in the older model, the center position has been adopted, drive being still on the left. Another change is the use of the Stewart vacuum system of fuel feed, replacing a cowl tank type. The reservoir is now at the rear.

The new four has Auto-Lite starting and lighting, the cranking motor being mounted same as last year—vertically at the front of the engine, driving through an enclosed chain and ratchet construction. Final drive is through a propeller shaft of enclosed type to a floating axle, and the distinctive Jackson spring suspension using elliptics all around is still adhered to.

The six has a 3 1-2 by 5 Northway motor. The engine details are principally L-head and block-cast cylinders with upper half of crankcase in unit. Three detachable cylinder heads are used, each covering two cylinders. The gearbox is in unit with the engine. Delco combination, ignition, lighting and cranking is used, and other specifications include cone clutch, open drive shaft fitted with two universals, floating axle. Unlike the four, the gasoline tank is in the

cowl and feeds by gravity.—Jackson Automobile Co., Jackson, Mich.

Jeffery Adds Light Six

With last year's four and six practically unaltered, the Jeffery company has added to its line a new \$1,650 six, the Chesterfield, which incorporates worm-drive axle, Stewart vacuum fuel feed, Empico speedometer drive, cantilever rear springs, three-plate, dry-disk clutch in place of the cone which the concern has used in past models and a Daimler type of leather universal joint between clutch and four-speed gearbox. The use of such a joint is new in this country but has met with success abroad. The joint is restricted to use on cars with straight line drive or in those where the shaft angularity is only slight.

The use of a three-plate disk clutch is the only change of importance made in the six formerly called model 96. The four still uses the cone clutch.

The new Chesterfield six uses a small high-speed motor, 3 by 5, with cylinders and the top of the crankcase a single casting. The cranking and lighting system is Bijur and consists of generator and cranking motor assisted by a Williard battery. The cranker, mounted on the left of the engine, has a square-end armature shaft upon which is a sliding pinion. This pinion meshes with teeth on the flywheel when the starting pedal is depressed. The lighting generator driven through the timing gears is mounted on the left of the motor with the regulator set on top of the generator housing. The regulator cuts in at between 7 and 8 miles per hour car speed.

Between the motor and the four-speed gearbox is a new three-plate, dry-disk clutch. From the gearset transmission is by spicer-joint shaft to an over-type worm gear driving a floating axle. It has 122-inch wheelbase and 34 by 4 tires.—Thomas B. Jeffery Co., Kenosha, Wis.

Kearns Tread Now Standard

The Kearns Motor Truck Co. remain in the passenger car field with a light four-cylinder car. This model which was brought out late last season has been lengthened from 90 to 105 inches and instead of offering an option of 44 or 56 inches tread, only the standard is now manufactured. To take care of the heavier body and chassis necessitated by the longer wheelbase, the motor has been increased from 2.75 by 4 to 2.875 by 4.5. Unit power plant scheme, however, with three-point suspension is continued.

In general this car might be said to be typical of the light car design which has become popular in the last season. In line with general practice on cars of this size, single magneto ignition is used, thermo-syphon cooling and gravity fuel feed. Head and tail lamps are electric and there are no side lamps. Fuel is fed to the carburetor by gravity from a 7-gallon gasoline tank. The disk clutch transmits the drive through a three-speed sliding gearset to a three-quarter floating rear axle mounted on ball bearings. The brakes are on the rear wheel and steering and control is optional. The wheel being placed on either the left or right side. Either a two- or four-passenger body, both of roadster lines are placed on this chassis.—Kearns Motor Truck Co., Beavertown, Pa.

King Has a V-Eight

An eight-cylinder, V-type, 2 3-4 by 5 motor installed in a chassis which is similar in design to that used for the four-cylinder model features the line of the King Motor Car Co., Detroit, for 1915. The four-cylinder model brought out in July of last year is a much refined car as compared with the previous year's model, though with full electric equipment it is offered for \$30 less than the 1914 price, \$1,195.

This eight-cylinder engine is the second to be installed as standard equipment in an American car, and it is com-

mentably designed for lightness, compactness and accessibility. All valve tappets are readily reached for adjustment which is accomplished by eliminating nearly everything from the space between the two four-cylinder blocks, the centerlines of which are at 90 degrees to each other. The crankshaft is the same in design as that used in a four-cylinder motor, this being possible due to the coupling of two connecting rods to each throw bearing. One rod has a yoked end which grips the outer ends of the bushing, while a small end rod goes between the two parts of the yoke. The bushing is pinned to the yoke rod with which it oscillates with the shaft as its bearing. The inner rod is free to move on the outer surface of the bushing.

The camshaft is directly above the crankshaft and driven by silent chain. Each cam operates two opposite valves through rocker arms with rollers bearing against the cams. These rockers are pivoted to the crankcase. The crankcase, being common to both sets of cylinders, is not much heavier than that of a four, while reciprocating parts have been made as light as possible so as to allow for moderately high speed operation. A spiral gear drive from the camshaft operates the ignition distributor set at the front end of the space between the cylinder blocks. Cooling is of thermo-syphon type and lubrication by force feed from the oil base to the main crankshaft bearings, and thence through drilled holes in the shaft arms to the rod bearings. The oil thrown from these lubricates the camshaft and other parts. The oil pump is driven by the same silent chain which runs from the crankshaft to the camshaft.

The four-cylinder motor is slightly increased in bore from 3 3/8 to 3 15-16 inches, the stroke remaining at 5 inches. The general construction of the engine has not been altered however. It is a block-cast, L-head design.

Both power plants incorporate the gearset in unit and are supported at three points. Ward-Leonard lighting and starting by two units is used with both engines.

The wheelbase of the King chassis, which is much the same for both cars, is 113 inches and the rear spring suspension is of the characteristic cantilever construction which was first used in this country on King cars. The clutch is a multiple disk running in oil. The drive is through an enclosed propeller shaft to a floating rear axle, the housing of which is of pressed steel. Left drive and center control are employed, and tires are 33 by 4.—King Motor Car Co., Detroit, Mich.

Kissel Adopts Block

A new six shown as the 42-six has been added to the line of the Kissel company. Of the two other cars in the line, the 36 four and six 48, the former has been reduced in price from \$1,850 to \$1,450 but the six-48 price is unchanged at \$2,350. Two-door touring bodies are being fitted to all the chassis which in the case of the improved models show some mechanical changes.

The model 36 now has a block-cast 4 1-2 by 5 1-2 motor instead of 4 1-2 by 5 1-4 pair-cast engine. Magneto ignition has been dropped and the combination Westinghouse cranking, lighting and ignition adopted. Stewart vacuum fuel feed is used instead of pressure, the tire size reduced from 35 by 4 to 34 by 4, the gear ratios have been altered and the camshaft drives by helical gears instead of silent chain.

The new six-42 has a 126-inch wheelbase and is fitted with a block-case, L-head 3 5-8 by 5 1-2 motor, cone clutch, three-speed gearset and 35 by 4 1-2 tires.

The unique feature of the Kisselkars is the employment of a two-door single-compartment body as standard. The arrangement is made possible by using individual chairs in the driver's compartment, which permits the use of a single door 26 inches wide, on each side of the body, giving entrance to both front and rear seats. The streamline idea is worked out to a nicety in this body job and an uninterrupted sur-

face obtained from the radiator top to the center of the car. In order to make access to the front seats from the rear easy, an aisle 8 inches wide is placed between the forward chairs. Side lamps are dispensed with. The design of the body is used on the four and five-passenger cars and to those preferring the conventional fore-door type, a five and seven-passenger also are offered.

The six 48 power plant consists of a 4 by 5 1-2 block motor, cone clutch and four-speed gearset with direct on third. Unusually large valves are used and the push rods clamped inside the valve inclosures. Instead of being pressed into the cylinders, the guide and rod can be removed easily without lifting the cylinders. Lubrication is by force feed through a drilled crankshaft, the oil being supplied from a self-contained reservoir and is drained back from the pistons to prevent smoking. This engine is built entirely in the Kissel shops.

A feature of the clutch is that it may be adjusted without disturbing any other part.

Centralization of all electric wires on a control panel fastened to the front of the dash is another decided feature and through this arrangement the wiring may be repaired or inspected without disturbing parts foreign to the system. The system makes body removal possible without cutting a wire.

The four-cylinder Kisselkar, the principal data of which were given previously, has a 121 inch wheelbase and is fitted with the two-door bodies described. The clutch is a cone and the gearset, a three-speed selective, the power plant being lighter than that of the model 40 of last season.—Kissel Motor Car Co., Hartford, Wis.

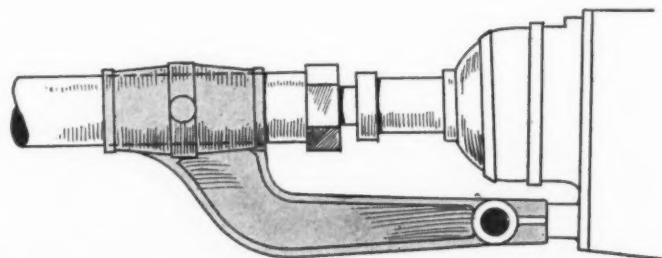
Kline Changes Pivot Point

Two sixes mounted on chassis which are the same in every detail with the exception of the wheelbase will make up the Kline line. These chassis are known respectively as 6-42 and 6-42-A. On the former there are mounted a touring, toy tonneau and roadster bodies, and on the latter a seven-passenger touring and a seven-passenger limousine. The wheelbases are respectively 123 and 127 inches.

The new six motor is an L-head. The three-point suspension scheme heretofore employed by the Kline company has been changed. The pivot point was formerly at the flywheel but has now been changed to the front on account of the change to the unit power plant. The radiator suspension has also been changed from the main side members to studs placed in the bottom of the radiator. This was done to relieve the strain due to the twisting of the side members.

A four-speed gearset was formerly used but now a three-speed takes its place. The reason advanced for this is that the new motor is more flexible and more powerful and the direct drive is quieter than the over-gear drive.

The electric starting motor has been changed to the left side of the engine and an enclosed Bendix gear fitted. The lighting generator is now on the right side and is driven by the pump shaft at 1.5 crankshaft speed instead of 3 to 1. The Stewart-Warner vacuum feed has replaced gravity feed for



King uses a bracket shaft support which allows for flexure in the cantilever rear springs

the gasoline and in body work a streamline design of rounded radiator and hood is another innovation. The entire electric equipment is taken care of by Westinghouse, in conjunction with a Willard battery. The cars on the 127-inch chassis have 35 by 4.5 tires and on the 123-inch chassis 34 by 4.—Kline Motor Car Corp., Richmond, Va.

Krit Uses Bigger Motor

Along with reductions in price, Krit models have larger and more roomy bodies, a more powerful motor and better equipment. All body types are fitted to the one standard chassis of 108-inch wheelbase. The price of the roadster and touring car models corresponding to those of last season is \$995 as compared with the old figure of \$1,050, this being with North East electrical equipment, one-man top, non-skid tires and additional instrument board units. A cabriolet has been added. In addition, another model with lower-priced equipment is offered on the same chassis for \$850.

While all bodies are streamline in design, a new feature on the higher-priced models only is the doing away with all moldings along the top edges, the metal of the sides rounding over the top edges in a smooth curve.

The Krit motor is an L-head block type, 3 3-4 by 4 and about 25 per cent. has been added to its power by increasing the valve diameter from 1 1-4 to 1 3-8 and by lightening the reciprocating parts and by redesigning the cams for wider valve opening and closer tappet adjustment. A new oiling system combines the flywheel pump system (heretofore used) with pump circulation, making it more positive and efficient.

Three chassis changes are of special note. First is the shifting to center from left control; second is the adoption of fore-and-aft steering mechanism to replace the cross type, this relieving the frame of the steering side thrust and therefore making steering easier; and third is the center frame cross member which now houses the brake cross rods and levers, relieving them of twisting strains.

In either roadster or touring form, the special sells for \$1,070 with such extra equipment as leather faced seat covers, five wire wheels, and option of color. Still another model is that which sells for \$850. This has less of the *de luxe* about its equipment and appearance though from the standpoint of service it is equal to any of the other models. It has Disco electric equipment, and all necessary features for service, but in order to bring the price down, such things as crowned fenders, one-man top, gasoline gauge and so on, which are fitted to the other models, are not included.

The gearbox is in unit with the engine, the propeller shaft is enclosed in a torsion tube, and the axle is semi-floating.—Krit Motor Car Co., Detroit, Mich.

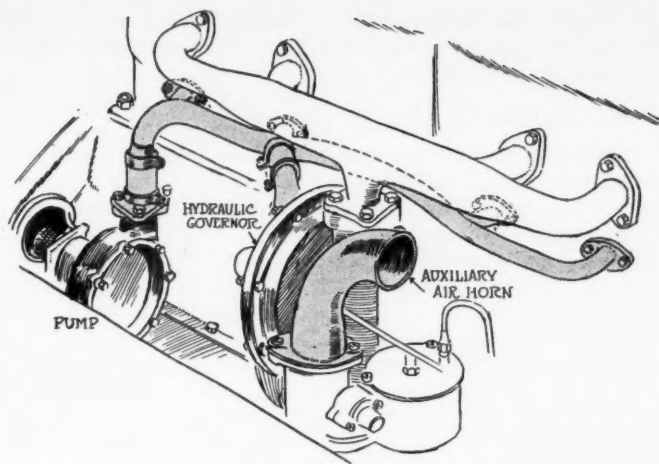
Lambert Alters Jackshaft

Two four-cylinder chassis, one with a 117-inch wheelbase and the other with 112, equipped with either Continental or Rutenber motors, are being continued by the Buckeye company, with a number of changes. These cars are similar in design and while retaining the friction drive which the Lambert has used for many years, the suspension of the jackshaft has been changed slightly so as to make a more accessible construction.

Bodies are entirely new, being of the streamline type with higher sides than formerly and a much wider rear seat. Attention has been paid to the upholstery to obtain more comfortable riding. Instead of using dash lights as heretofore, a small lamp is incorporated in the headlights.

Battery ignition, using the accumulator of the lighting system and a distributor, supplants a magneto. The entire electrical system still is of Briggs make and shows no important changes in the cranking and lighting units.

The cowl gasoline tank has been made larger and the filler neck placed inside the cowl instead of on top outside. Other changes in Lambert cars include the fitting of a ball on the



Packard hydraulic governor for keeping the speed of the motor constant. It is operated by a diaphragm

shifter lever to make speed changes easier and the adoption of a steering post, which, in the course of construction can be varied in length to suit the requirements of the purchaser. The radiator has been improved by giving it a more shapely appearance to conform with the lines of the rest of the car.

The large Lambert chassis is fitted with either Continental or Rutenberg motor, 4 1-8 by 5 1-4 and sells for \$1,565 with roadster or touring body. The drive is by friction set and single silent chain to a semi-floating type rear axle.

The 112-inch wheelbase model is fitted with optional motor type as mentioned, but the size is 3 3-4 by 4 and the price \$1,200 in five-passenger form.—Buckeye Mfg. Co., Anderson, Ind.

Lexington Has New Six

Three Lexington models are marketed for this season; the leader is a new light six known as the Thoroughbred. In addition there is a larger six and a four.

With the exception of the motor the design of the new six is similar to that of the four. The engine is an L-head block 3.5 by 5 fitted with the Moore multiple exhaust system as are the other motors used in Lexington cars. In this system the exhaust manifold is cast so that the exhaust from each cylinder has an independent passage giving a gain in power through the elimination of the entrance of dead gases into the cylinders. Westinghouse cranking, lighting and ignition is used on this model. Its wheelbase is 128 inches and the transmission system consists of a disk clutch, three-speed gearset having the gearbox bolted to the crankcase and a three-quarter floating rear axle with a ratio of 41. Cantilever springs are used.

The four-cylinder is now equipped with a Teetor T-head power plant whose dimensions are 3.875 by 5.375. Last season the four had an I-head motor with 4 by 5 cylinders. Cantilever rear springs supplant the three-quarter elliptic and another change has been made in the introduction of the Westinghouse cranking, lighting and ignition apparatus. In conjunction with the introduction of the Stewart vacuum gasoline feed the gasoline tank has been moved from under the front seat to the rear of the chassis. Improvements in the form of body work and equipment are notably in the adoption of streamlines and the fitting of a one-person top and a power tire pump.

The large six-cylinder model has not received many mechanical changes as compared to the four. In common with the latter, however, the gasoline feed is now by the Stewart vacuum system and the tank is at the rear instead of under the seat. A power tire pump has also been added to this model and the body lines have been improved so that the hood now slopes from the radiator to the cowl and the

instruments are now on a cowl board. Otherwise the six remains the same as for last season.—The Lexington-Howard Co., Connersville, Ind.

Lewis Smacks of Foreign Design

The Lewis six shows no radical changes, but alterations have been made in the adoption of the Stewart vacuum gasoline feed and the Remy electric cranker. The radiator has been rounded slightly.

This car sells at \$1,600. The motor shows marked tendencies toward foreign design. Its dimensions are 3 1-2 by 6 and the crankcase and cylinders are cast as a unit. Two other units form the principle motor parts, the cylinder head which is bolted on and the crankcase cover plate. The assembled job gives a decidedly neat appearance, clean, accessible and shows forethought in the positioning of the fittings. The magneto is set transversely on the left in front of the breaker box and distributor facing the outside so that adjustments can be made easily. The carbureter is rather high and about clears the frame. It feeds from a short straight manifold to a passage in the cylinder casting and across the motor to the valves on the opposite side. On the same side is the vacuum feed gasoline tank.

In the motor lubrication combination splash and force feed is employed and not only is the motor properly supplied but the reservoir takes care of the clutch and gearset as well, replenishment being by a flywheel which acts in the capacity of a pump. The lubrication has been carried a step farther and the entire valve mechanism including springs, guides, etc., is housed within the crankcase walls so as to receive proper oil supply by splash, so reducing wear on these parts considerably.

The clutch is a running in oil disk, the gearset a three-speed selective.

The wheelbase is 135 inches and the tires are 36 by 4.—I. P. C. Motor Co., Racine, Wis.

Locomobile Left Drive Only

Two sixes comprise the Locomobile line. They are continuations of the 38 L-D and the 48 L-D of last season with refinements which are principally found in the body and equipment. The two right drive cars built last season have been discontinued, leaving only left drive cars for the 1915 season.

The adoption of the single wiring Westinghouse Electric Light and Starting system with a special push-button control switch designed by the Locomobile engineers is the chief refinement. With this control starting has been reduced to the pressing of a button, the shifting of the starting gear being accomplished electrically through a solenoid instead of manually. All the electrical push-buttons are now placed in a vertical row in the instrument board and the starter button being at the bottom may be operated by the foot. Other refinements include the use of drop forging for many of the small parts such as windshield brackets, bonnet clips, throttle levers, etc. The top is provided with a lining concealing the bows, and in the interior work the decorative scheme has been considerably improved. The fenders are more heavily crowned and are made in one piece, the brakes are 2 inches larger in diameter and the tread has been widened to the standard 56 instead of 54.5.

The two motors for the 38 and 48 are similar in design and do not depart from Locomobile practice of the last two years except that when the company changed to left drive last season the alterations necessary in putting the steering column on the other side of the motor had to be made. Both motors have T-head cylinders cast in pairs. The sizes are respectively 4.25 by 5 and 4.5 by 5.5. The makers claim horsepower output of 63 and 82 at 1,800 r.p.m. In the body work luxury has been the keynote of design and the roadster is featured by a rear deck with a folding compartment contain-

ing extra seats for two passengers.—Locomobile Co. of America, Bridgeport, Conn.

Lyons-Knight Uses Worm Drive

No changes of importance have been made in the four-cylinder Lyons-Knight model K.

Aside from its sleeve-valve engine the feature of this car is the worm-drive axle incorporating the gearset, the only American car on the market using this combination. The worm is mounted above the worm wheel and gives an axle clearance of 10 inches.

The motor, 4.5 by 5.5 with pair-cast cylinders, uses aluminum for the cylinder head covers and chain case. The covering for the cylinder heads is designed to keep out dirt and moisture and protect the spark plugs, this being exclusive with the Lyons motor. Force feed lubrication is used for the sleeves, all bearings and the pistons. A plunger pump, controlled by one of the eccentric rods, takes oil from a reservoir in a sump in the crankcase, and forces it under pressure to the crankshaft and eccentric shaft bearings, the eccentric rod bearings and then through a duct in the crankshaft center to the connecting-rods. These rods are hollow and the oil is forced upward in them to the top rod bearings, thence to hollow piston pins to the piston exterior and through holes in the sleeves to the cylinder walls. The oil pressure is in proportion to motor speed.

A single-unit North East cranking and lighting device drives by silent chain from the front end of the crankshaft. A three-plate dry-disk clutch and three-speed selective gearset take the motor drive.—Lyons Atlas Co., Indianapolis, Ind.

Marmon Refines Small Six

As heretofore, Marmon has two sixes, the larger continued without change, and the smaller model 41 a refined edition of the former small six. The most radical change is in the equipment, namely the full Bosch outfit, including, magneto, starter and generator all in separate units and in addition all the switches, wiring, lamps, bulbs, etc. Marmon was the first company to adopt the system.

The smaller model is a more attractive job than its predecessor, in that the body lines have been considerably beautified, with the sides higher, together with a sloping hood and rounded radiator. The fenders have a different camber and the luggage carrier and battery box have been removed from the running boards, leaving these free and clear.

A few motor changes have been made, due to the new lighting, starting and ignition system. In order to avoid running the magneto shaft through the pumps the latter has been moved forward. Pistons are longer with three rings above the wrist pin. The upper two are concentric packing rings and the lower a concentric oil ring with nine .125-inch holes drilled around the circumference at an angle of 45 degrees to the axis of the cylinder.

The starting motor engages with a gear connected with the flywheel, whereas in previous models the starter insulation was by chain drive in a separate housing in the rear of the motor. A new design of cone clutch faced with thermoid is used. The Stromberg carbureter, Silvertown cord tires, one-man top, and larger brake cams are features. The 4.25 by 5.5, L-head power plant with cylinders cast in threes is continued. On this chassis there is a five-passenger body at \$3,250. Roadster and speedster at the same price, and in the more expensive bodies there is a seven-passenger touring design at \$3,350.—Nurdyke & Marmon Co., Indianapolis, Ind.

Maxwell Revises Exterior

The 1915 Maxwell 25, the only chassis model which the Maxwell Co. is making, is much altered in outward appearance from its predecessor, largely due to the sloping body and hood, and the crowned fenders. With these new clothes and several mechanical changes, there is a uniform reduc-

tion of \$55 throughout the line of body types. However, if starting and lighting by electricity are required instead of the gas and oil lighting furnished at the above prices, \$55 must be added to the price of any model. Thus, the price of the electrified car is the same as that of last season's car without such advantages.

Besides the new form of bodies, the gasoline tank has been shifted from under the seat to the cowl position, while another important change is the replacement of the semi-elliptic rear springs, which are connected to spring horns at their rear ends, by three-quarter rear springs having scroll ends. On the motor, the carbureter has been shifted from the left of the engine to the right to make room for the electrical units when supplied. A new radiator construction is also used in which the shell is separate from the core, and any jar which the former receives is not transferred to the delicate core, thus making less the possibility of springing leaks.

The Maxwell chassis is of 103-inch wheelbase and has a 3 5-8 by 4 1-2 block, L-head motor, with the three-speed gearbox in unit. The drive features include cone clutch, enclosed propeller shaft and three-quarter floating rear axle. Left drive and center control are used, and the tire equipment is 30 by 3 1-2 all around.

The body is entirely smooth, and door latches and hinges are concealed. One other improvement is the addition of an instrument board which carries the usual array of control devices as well as the filler cap for the gasoline tank.—Maxwell Motor Co., Detroit, Mich.

McFarlan Adopts Cone Clutch

Five changes of importance show in the McFarlan the six. These changes are: The adoption of a cone instead of a disk clutch, Stewart vacuum gasoline feed in place of pressure, increase in the wheelbase 4 inches to 132, option of electric in place of a pneumatic cranking system, and the fitting of a new body. The single chassis is fitted with either a 4 by 6 or 4 1-3 by 6 motor.

The motor, a T-head block design, is regularly fitted with Westinghouse lighting and ignition system, but the Westinghouse cranking unit is optional, as stated. In the generating system the current output increases when the load on the battery increases, which is effective in keeping the battery charged at all times. There is not an exposed wire, flexible conduits being used for housing them and the conductors.

The new clutch is a 16-inch cone, with twelve flat adjustable springs under the leather. The entire unit is comparatively light, peripheral weight reduction resulting in the stoppage of clutch spinning and hence making gearshifting easier. The gearbox still has three speeds and is unit with the floating axle.

The body is lower and the lines have been improved upon. There is a small cowl over the back of the front seat which serves not only to show fashion advancement, but also is practical for the carrying of parcels, gloves, hand bags, etc. The upholstery does not extend over the body edge at any point.—McFarlan Motors Co., Connersville, Ind.

McIntyre Imp Drops Air Cooling

While the McIntyre company is manufacturing three models, one of them, the four-cylinder model 25, is taking almost the entire energy of the plant. This model, in five-passenger form, is the best appearing job which has up to this time been marketed by the company. The others are model 6-40 Hoosier, and the Imp the second, the reconstructed cyclecar, which, however, shows little of the original car's design. The 6-40 Hoosier was called the 6-40 Limited in 1914 and mechanically there has been but one important change made, that of transferring the steering post from right to left side. The price has been reduced from \$1,685 to \$1,275, and a one-man top added. The Imp model now has a four-cylinder water-cooled motor and a

side-by-side body instead of two-cylinder air-cooled engine and tandem seating.

On the new model 25 a slope from windshield to a V-shaped radiator which is longer than is usually seen is used. The wheelbase is 106 inches.

A Golden, Belknap and Swartz motor, 3 3-4 by 4 1-4 with L-head, block-cast cylinders is used. Cooling is by the thermo-syphon system and oiling by force feed and splash in which a plunger pump takes oil from the crankcase and forces it through a dash sight feed from whence it travels to the crankshaft bearings, overflowing and dropping again to the reservoir. The clutch is a three-plate running-in-oil type and drives by shaft to a three-speed gearbox. Rear spring suspension is by cantilevers.—W. H. McIntyre Co., Auburn, Ind.

Meteor Has Four and Six

Two models, a four and a six, make up the Meteor line. Both these models with the exception of the power plants and wheelbases are constructed along the same lines. Both are provided with L-head power plants with the cylinders cast in pairs and valves on the left side. The dimensions of the four are 4 by 5 and of the six, 3.75 by 5, the six, although of smaller dimensions, having a higher power rating than the four, the actual figures, being 25.6 and 33.6 by the S. A. E. formula. The piston displacements of these two models are respectively 251.3 and 331.4 inches. The wheelbases are respectively 114 and 126 inches.

Pump water circulation is used in both these cars and lubrication is by a combined pressure and splash feed in which the oil is carried from the reservoir in the crankcase by direct leads to each of the main bearings. The oil which flows from these bearings supplies the splash troughs which are located beneath each connecting rod throw.

Electrical equipment for both cars is furnished by the Splitdorf-Apple apparatus for starting and lighting and the Atwater Kent system for ignition. The battery is the sole source of ignition current and the control of the spark advance is either hand or automatic as suits the driver. That is, should the spark lever not be used the automatic advance would take care of the spark position but if desired a change in advance can be made by using the hand lever.

Both models use disk clutches and three speed gearboxes, both clutches and gearboxes being combined with the motor to form a unit power plant. The final drive is by bevel gear, torque and drive being taken through the springs. Both cars have the same reduction gears in the rear axles, the final ratio being 3.7 to 1. The tires on the four are 34 by 4, and on the six, 35 by 4. The wheels are wood. The steering wheels are located on the left with the control levers in the center. The four is fitted with only one type of body, this being a five-passenger touring at \$1,075.—Meteor Motor Car Co., Shelbyville, Ind.

Metz Adds Larger Model

The introduction of an entirely new chassis upon which a touring body is mounted is a radical departure from previous Metz practice which has confined itself thus far to roadster and raceabout constructions. While the new chassis is larger throughout than the one on which the roadster continued to be mounted the principles of construction are the same. The motor has .125-inch more bore than that used on the roadster but the stroke is the same, the dimensions being 3.875 by 4.

Other than the dimensions of the motor and the necessity for making the parts larger throughout a description of the smaller Metz will serve for the larger. The tires on the touring car, however, are 32 by 3.5 inches, the wheels are wire and the wheelbase 105 inches. The new car is fitted with Bosch magneto and a Gray & Davis 6-volt electric starting and lighting system. Left drive and center control

are used. The friction drive which has characterized Metz cars in the past remains the same.

Improving the appearance and bettering the equipment has been the extent of the changes made in the Metz roadster. As far as mechanical changes are concerned there are none except those necessitated by a 6-inch increase in the wheelbase and the fitting of the gasoline tank in the cowl.

The L-head 3.75 by 4-inch motor is cast in block with enclosed valves. The crankshaft and camshaft are steel forgings ground to a finish fit and carried in white metal bearings. The motor is lubricated by constant-level splash with pump circulation. Cooling is by thermo-syphon and ignition by a Single Bosch high-tension system.

There is no clutch on the Metz car, speed changes being effected by sliding the friction wheel along the face of its driving disk. When the drive is arranged to take its lowest reduction, or, in other words, on direct a ratio of 3 to 1 is provided. The frame is of pressed steel and the springs are full elliptic. The tires are 30 by 3 inches.—The Metz Co., Waltham, Mass.

Mitchell Adds Two Models

Two new cars, a four and a six of design practically the same throughout, are featured by the Mitchell-Lewis company for 1915. The four-cylinder model which sold for \$1,585 has been discontinued.

The motor size of the new four and six is the same and the design of the other chassis parts also, hence a description of the four will do for the six.

The new four and six are the only 1915 Mitchells with a motor using L-head cylinders and these are 4 by 5 1-2, cast in pairs. Light reciprocating parts and balance of parts has been given special attention so as to reduce vibration. The oiling system makes use of a plunger pump which forces oil from a reservoir in the crankcase to troughs under the connecting rods, to the timing gears, to the silent chain at the front of the engine and to the dash sight feed which has two outlets, one leading to the clutch bearing through a flexible tube and the other to the rear crankshaft bearing. A breather arrangement from the crankcase to the valve chambers offers a means of valve mechanism lubrication by oil vapor from within.

Simplicity is seen in the fan and water pump assembly. A centrifugal pump operating at unusually high speed is mounted upon the front end of the fan shaft where it is accessible, close to the radiator, driven without extra mechanism and should the water within become frozen, and injure the pump, the outlets are large enough to cool the engine by the syphonic system.

The exhaust manifold instead of discharging at the rear does so at the front, which lessens the heat under the driver's seat and provides a cooling means for the exhaust pipe, it being in range of the cooling fan draught.

The drive from this motor is by a cone clutch of new design using a light, stamped-steel member with three steel coil springs under the leather to make engagement smooth. A three-speed gearset is bolted to the front end of a torque tube which incloses the drive shaft. Bevel final drive in a floating axle is used as in past Mitchell practice.

The wheelbase of the car is 116 inches, tires 34 by 4 and the equipment includes an Apelco cranking and lighting system of the unit type, the motor-generator being driven by silent chain and geared 2.6 to 1 with the motor. Control is such that at 8 miles per hour the generator is delivering 6 amperes to the storage battery which is located on the running board.

Insofar as design is concerned the special six and de luxe six, the three continued cars, are practically the same. The principal dimension differences lie in the wheelbase. The special four is 120 inches from wheel to wheel, the special six 132 and the de Luxe six, 144. The motors in all are

4 1-4 by 7, T-head jobs cast in pairs and using Remy ignition and Rayfield carbureter. The drive in all is like that of the new four which adheres to Mitchell past design.—Mitchell-Lewis Motor Co., Racine, Wis.

Moline-Knight Four Speeds

The Moline-Knight made in one model, sells at \$2,500 or \$100 more than last season. The increase is due to many changes, chief among which is the adoption of a four-speed gearset. This gearset is used only on the open cars and has been separated from the motor, thus abandoning unit power plant construction and using four- instead of three-point motor suspension. The separation of the units was necessary because of the new gearset and brought with it the desired result of eliminating the gear noises magnified by the sounding-board characteristics of the large aluminum housing previously used. The new gearset has made it necessary also to use a sub-frame with the result that gear shift lever and hand brake lever are nearer the front seat and more accessible to the driver.

The next important place of reconstruction is in the rear axle which now employs spiral-bevel gears. A third change is in the motor where the exhaust manifold, formerly water-jacketed and cast with the cylinders, now is bolted on and not waterjacketed, thus effecting better cooling of the cylinders themselves. Other slight changes are the substitution of a screw-and-nut steering post for the worm-and-sector; the fitting of a single-cylinder motor-driven tire pump instead of the two-cylinder pump and the use of Whitney chains for driving the motor shafting.

The Moline-Knight engine, 4 by 6, is the first block cast Knight to be announced in America and one of two offered this year. Thermo-syphon cooling is another departure from conventional Knight practice and this is the only motor so cooled. The water travels from the radiator through a two-arm manifold, the arms attaching to the lowermost portion of the cylinder casting. The water circulates the entire length of the cylinder barrel through the intake manifold around the cylinder head and tops of the sleeves and goes so far as to cool the portion around the spark plugs.

The oiling system through a gear pump forces oil, at pressures up to 40 pounds, to every part requiring lubrication. The first passage to receive oil from the pump is a duct which extends the entire length of the crankshaft bearing plate and is tapped at three places where leads go to the main bearings. At the main bearing wrist holes are drilled in the crankshaft, the holes communicating with the connecting rod bearings. The rod bearing hole registers once each revolution with a hole in the upper portion of the rod bearing. This hole communicates with the hollow rod which receives oil to feed to the wristpin. An automatic governor connected with the throttle regulates the oil pressure in proportion to the speed.

The motor uses Bosch duplex ignition, Schebler carbureter and the drive from it is by cone clutch and new gearbox to a floating axle. Cranking and lighting is by the Wagner 12-volt, two-unit system.—Moline Automobile Co., East Moline, Ill.

Monarch Makes a Six

Monarch is offering a six this season. This machine, with 3 1-2 by 5 Continental motor and wheelbase of 125 inches, is the only model now made by the concern, which last year marketed two fours and a six.

The block type, L-head engine has the gearset in unit, and the whole assembly is three-point suspended. Cooling is by centrifugal pump, and ignition is by Atwater Kent with lighting and cranking by Ward Leonard equipment. The cranking function is worked out through application of the turning effort to the flywheel through the Bendix drive mechanism.

Other design features include left drive and center control, Hartford cone clutch having springs under the leather, 13-gallon cowl gasoline tank, Salisbury three-quarter floating axle, wood wheels carrying 33 by 4 tires on demountable rims and elliptic rear springs.

The body has no exposed door hinges or latches, and running boards are also clear. The front seat is divided, and Turkish upholstery makes comfortable riding. The price of \$1,250 is with five-passenger body, although it is plenty roomy for two extra seats, these being obtainable to fit the car at an extra cost of \$25.—Monarch Motor Car Co., Detroit, Mich.

Monroe Has Block I-Head

A new roadster has been announced by the Monroe company which, while a new concern to the industry, is closely related to the Chevrolet company through the possession of common stockholders. The car is in the low-priced class, selling for \$460. It has a block motor with valve-in-head and in general lines resembles very much the Little car formerly produced by the Chevrolet company. The 3 by 3.75 power plant delivers the power through a 10.5-inch clutch to a three-speed gearset.

In spite of the low price of the car it is thoroughly up-to-date with its electric equipment, being fitted with electric lighting and for \$35 extra with electric starting. The generator is on the right side of the motor and is at the forward end, being driven from the timing gears. When the starting motor is fitted it is on the same side of the engine and engages with the flywheel by means of spur teeth. The engagement of the driving pinion of the starting motor is controlled by a Bendix gear.

Thermo-syphon cooling is used and the radiator is supplied with an auxiliary tank at the top. A belt-driven fan also aids in the cooling.

A combination splash and pressure system takes care of lubrication. The pump delivers the oil to the connecting rods, bearings and timing gears, and the cylinders receive their lubrication through the splash.

The gears used in the gearbox are nickel steel and they are carried on ball bearings throughout. The shifting lever is mounted directly at the rear of the gearbox and provides a direct control of the gearbox without intermediate levers. The rear axle is semi-floating and torque is taken through a tube connected to the rear end of the gearbox by a forked yoke. Steering is by a worm and gear with spark and throttle lever mounted under the wheel. The control instruments such as the ignition switch, dimming switch and ammeter are on the cowl board.—Monroe Motor Co., Flint, Mich.

Moon with Hotchkiss Drive

Two sixes have been added to the Moon line. The new cars show evidence of past Moon practice and the departures are in the nature of weight-reduction, the obtaining of better riding, new bodies, a new type of disk clutch, Hotchkiss drive, Stewart vacuum fuel feed and a new rounded radiator.

The model 6-50 has a 130-inch wheelbase instead of 129-inch, the doors have been widened 1 inch to 22 inches and the upholstery is deeper. There is more legroom. In reconstructing the clutch the wear on the plates has been reduced, due to a new manner of holding them. In the rear axle, a crucible steel housing takes the place of malleable iron, which reduces the weight about 100 pounds. Two inches greater diameter brings the drums to 16 inches, and a new brake-equalizing system has been installed. The Delco distributor is operated by silent chains instead of gears, and the equipment has been broadened so as to include Stewart vacuum fuel feed and Klaxon horn. The price still is \$2,250.

The two new cars are similar in construction and general appearance and should be admired chiefly for the body design.

The chassis features of both the 6-40 and the 4-38 are the same but the former has slightly heavier parts. The motor dimensions of the four are 3 3-4 by 5 and the six 3 1-2 by 5. An improved one-wire Delco system is used and Stewart vacuum feed added. As a unit with the motor is a dry-disk clutch and a three-speed gearset, products of the Warner Gear Co.

Propulsion is through the springs constituting the Hotchkiss drive which eliminates the torque rod and makes the springs take most of the driving strains. A new braking system is used and the number of brake-system parts is reduced from 50 to 22. In the new system a more direct action from pedal to bands is obtained with a smaller equalizing beam at the rear almost above the axle housing. Last season a long beam was used in the center of the chassis. Both cars have 122-inch wheelbase and 34 by 4 tires, underslung rear springs and dimmers in the headlights.

The 6-50 has a 3 3-4 by 5 1-4 motor, new disk clutch, four-speed gearset, floating axle and new braking system.—Moon Motor Car Co., St. Louis, Mo.

National Stiffens Crankcase

The National line is the same six and four as in 1914. Mechanically the cars are practically unchanged except that in the six several refinements have been made. The chief change is the fitting of an entirely new electrical outfit comprising the Eisemann magneto which serves as the sole source of ignition current, and the Westinghouse starting and lighting outfit which replaces that formerly used. In refining the motor, 25 per cent. has been cut off the weight of the reciprocating parts. The crankcase is heavier and more rigid and an improved type of oil screen is fitted. In the gearbox the travel of the sliding pinion is increased .25 inch. Silico-manganese steel replaces carbon steel in the springs. Larger wheel bearings are used. Wheelbase is 134 inches.

The power plant of the six is a 3.75 by 5.5, L-head, block design with waterjacketed intake manifold and with the valve mechanism inclosed. The newest Rayfield carburetor has been fitted in connection with a pressure feed gasoline system. The four, a 4.875 by 6, T-head design has its cylinders in pairs.

In body work the National company is featuring a four-passenger boat design with four individual seats mounted on tracks so that they can be placed about the body in nearly any desired position. There is a fifth additional seat which folds into the rear of the body. It is invisible except when in use. The entire body follows boat practice with a curved gunwale line and moulded fore and aft curvature. The other standard bodies have been brought thoroughly up to date and follow streamline practice. The six sells for \$2,375 and the price of the four is \$2,750.—National Motor Vehicle Co., Indianapolis, Ind.

Norwalk Adopts Monoblock

Norwalk has dropped one model and added another for this season. Last year two sixes were marketed, known as C and D. The model which has been dropped is the D, which leaves the larger six continued and the new model F is a distinct departure from previous Norwalk practice. It is also a six but instead of having the cylinders cast in threes, it has a mono-block construction. In all other respects the chassis itself is practically the same as the model D but in the matter of outfitting, the single wire system is used instead of the double wire; double bulb headlights are used instead of side lights and control is by hand instead of electric.

The body styles marketed for this season are for the model C, a six-passenger touring, an open and a closed limousine. For model F, there is a two-passenger roadster, six-passenger touring, two-passenger coupé, four-passenger sedan and six-passenger limousine.

The model F which will be the leader for this season has

are used. The friction drive which has characterized Metz cars in the past remains the same.

Improving the appearance and bettering the equipment has been the extent of the changes made in the Metz roadster. As far as mechanical changes are concerned there are none except those necessitated by a 6-inch increase in the wheelbase and the fitting of the gasoline tank in the cowl.

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The next important place of reconstruction is in the rear axle which now employs spiral-bevel gears. A third change is in the motor where the exhaust manifold, formerly water-jacketed and cast with the cylinders, now is bolted on and not waterjacketed, thus effecting better cooling of the cylinders themselves. Other slight changes are the substitution of a screw-and-nut steering post for the worm-and-sector; the fitting of a single-cylinder motor-driven tire pump instead of the two-cylinder pump and the use of Whitney chains for driving the motor shafting.

The Moline-Knight engine, 4 by 6, is the first block cast Knight to be announced in America and one of two offered this year. Thermo-syphon cooling is another departure from conventional Knight practice and this is the only motor so cooled. The water travels from the radiator through a two-arm manifold, the arms attaching to the lowermost portion of the cylinder casting. The water circulates the entire length of the cylinder barrel through the intake manifold around the cylinder head and tops of the sleeves and goes so far as to cool the portion around the spark plugs.

The oiling system through a gear pump forces oil, at pressures up to 40 pounds, to every part requiring lubrication. The first passage to receive oil from the pump is a duct which extends the entire length of the crankshaft bearing plate and is tapped at three places where leads go to the main bearings. At the main bearing wrist holes are drilled in the crankshaft, the holes communicating with the connecting rod bearings. The rod bearing hole registers once each revolution with a hole in the upper portion of the rod bearing. This hole communicates with the hollow rod which receives oil to feed to the wristpin. An automatic governor connected with the throttle regulates the oil pressure in proportion to the speed.

The motor uses Bosch duplex ignition, Schebler carbureter and the drive from it is by cone clutch and new gearbox to a floating axle. Cranking and lighting is by the Wagner 12-volt, two-unit system.—Moline Automobile Co., East Moline, Ill.

Monarch Makes a Six

Monarch is offering a six this season. This machine, with 3 1-2 by 5 Continental motor and wheelbase of 125 inches, is the only model now made by the concern, which last year marketed two fours and a six.

The block type, L-head engine has the gearset in unit, and the whole assembly is three-point suspended. Cooling is by centrifugal pump, and ignition is by Atwater Kent with lighting and cranking by Ward Leonard equipment. The cranking function is worked out through application of the turning effort to the flywheel through the Bendix drive mechanism.

Other design features include left drive and center control, Hartford cone clutch having springs under the leather, 13-gallon cowl gasoline tank, Salisbury three-quarter floating axle, wood wheels carrying 33 by 4 tires on demountable rims and elliptic rear springs.

The body has no exposed door hinges or latches, and running boards are also clear. The front seat is divided, and Turkish upholstery makes comfortable riding. The price of \$1,250 is with five-passenger body, although it is plenty roomy for two extra seats, these being obtainable to fit the car at an extra cost of \$25.—Monarch Motor Car Co., Detroit, Mich.

Monroe Has Block I-Head

A new roadster has been announced by the Monroe company which, while a new concern to the industry, is closely related to the Chevrolet company through the possession of common stockholders. The car is in the low-priced class, selling for \$460. It has a block motor with valve-in-head and in general lines resembles very much the Little car formerly produced by the Chevrolet company. The 3 by 3.75 power plant delivers the power through a 10.5-inch clutch to a three-speed gearset.

In spite of the low price of the car it is thoroughly up-to-date with its electric equipment, being fitted with electric lighting and for \$35 extra with electric starting. The generator is on the right side of the motor and is at the forward end, being driven from the timing gears. When the starting motor is fitted it is on the same side of the engine and engages with the flywheel by means of spur teeth. The engagement of the driving pinion of the starting motor is controlled by a Bendix gear.

Thermo-siphon cooling is used and the radiator is supplied with an auxiliary tank at the top. A belt-driven fan also aids in the cooling.

A combination splash and pressure system takes care of lubrication. The pump delivers the oil to the connecting rods, bearings and timing gears, and the cylinders receive their lubrication through the splash.

The gears used in the gearbox are nickel steel and they are carried on ball bearings throughout. The shifting lever is mounted directly at the rear of the gearbox and provides a direct control of the gearbox without intermediate levers. The rear axle is semi-floating and torque is taken through a tube connected to the rear end of the gearbox by a forked yoke. Steering is by a worm and gear with spark and throttle lever mounted under the wheel. The control instruments such as the ignition switch, dimming switch and ammeter are on the cowl board.—Monroe Motor Co., Flint, Mich.

Moon with Hotchkiss Drive

Two sixes have been added to the Moon line. The new cars show evidence of past Moon practice and the departures are in the nature of weight-reduction, the obtaining of better riding, new bodies, a new type of disk clutch, Hotchkiss drive, Stewart vacuum fuel feed and a new rounded radiator.

The model 6-50 has a 130-inch wheelbase instead of 129-inch, the doors have been widened 1 inch to 22 inches and the upholstery is deeper. There is more legroom. In reconstructing the clutch the wear on the plates has been reduced, due to a new manner of holding them. In the rear axle, a crucible steel housing takes the place of malleable iron, which reduces the weight about 100 pounds. Two inches greater diameter brings the drums to 16 inches, and a new brake-equalizing system has been installed. The Delco distributor is operated by silent chains instead of gears, and the equipment has been broadened so as to include Stewart vacuum fuel feed and Klaxon horn. The price still is \$2,250.

The two new cars are similar in construction and general appearance and should be admired chiefly for the body design.

The chassis features of both the 6-40 and the 4-38 are the same but the former has slightly heavier parts. The motor dimensions of the four are 3 3-4 by 5 and the six 3 1-2 by 5. An improved one-wire Delco system is used and Stewart vacuum feed added. As a unit with the motor is a dry-disk clutch and a three-speed gearset, products of the Warner Gear Co.

Propulsion is through the springs constituting the Hotchkiss drive which eliminates the torque rod and makes the springs take most of the driving strains. A new braking system is used and the number of brake-system parts is reduced from 50 to 22. In the new system a more direct action from pedal to bands is obtained with a smaller equalizing beam at the rear almost above the axle housing. Last season a long beam was used in the center of the chassis. Both cars have 122-inch wheelbase and 34 by 4 tires, underslung rear springs and dimmers in the headlights.

The 6-50 has a 3 3-4 by 5 1-4 motor, new disk clutch, four-speed gearset, floating axle and new braking system.—Moon Motor Car Co., St. Louis, Mo.

National Stiffens Crankcase

The National line is the same six and four as in 1914. Mechanically the cars are practically unchanged except that in the six several refinements have been made. The chief change is the fitting of an entirely new electrical outfit comprising the Eisemann magneto which serves as the sole source of ignition current, and the Westinghouse starting and lighting outfit which replaces that formerly used. In refining the motor, 25 per cent. has been cut off the weight of the reciprocating parts. The crankcase is heavier and more rigid and an improved type of oil screen is fitted. In the gearbox the travel of the sliding pinion is increased .25 inch. Silico-manganese steel replaces carbon steel in the springs. Larger wheel bearings are used. Wheelbase is 134 inches.

The power plant of the six is a 3.75 by 5.5, L-head, block design with waterjacketed intake manifold and with the valve mechanism inclosed. The newest Rayfield carburetor has been fitted in connection with a pressure feed gasoline system. The four, a 4.875 by 6, T-head design has its cylinders in pairs.

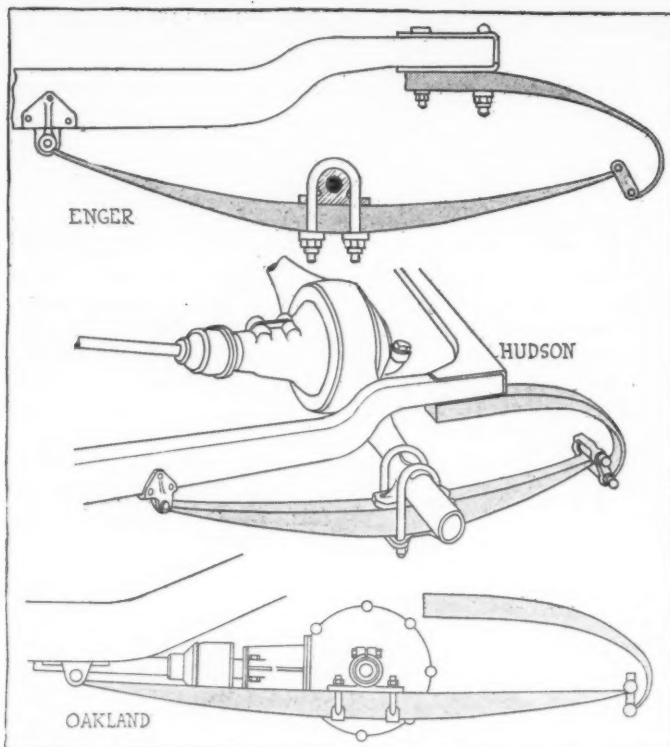
In body work the National company is featuring a four-passenger boat design with four individual seats mounted on tracks so that they can be placed about the body in nearly any desired position. There is a fifth additional seat which folds into the rear of the body. It is invisible except when in use. The entire body follows boat practice with a curved gunwale line and moulded fore and aft curvature. The other standard bodies have been brought thoroughly up to date and follow streamline practice. The six sells for \$2,375 and the price of the four is \$2,750.—National Motor Vehicle Co., Indianapolis, Ind.

Norwalk Adopts Monoblock

Norwalk has dropped one model and added another for this season. Last year two sixes were marketed, known as C and D. The model which has been dropped is the D, which leaves the larger six continued and the new model F is a distinct departure from previous Norwalk practice. It is also a six but instead of having the cylinders cast in threes, it has a mono-block construction. In all other respects the chassis itself is practically the same as the model D but in the matter of outfitting, the single wire system is used instead of the double wire; double bulb headlights are used instead of side lights and control is by hand instead of electric.

The body styles marketed for this season are for the model C, a six-passenger touring, an open and a closed limousine. For model F, there is a two-passenger roadster, six-passenger touring, two-passenger coupé, four-passenger sedan and six-passenger limousine.

The model F which will be the leader for this season has



Upper—Rear spring suspension on the Enger. Middle—Rear construction employed on the Hudson, showing springs slung under the rear axle. Lower—Oakland rear construction, showing method of carrying springs under axle

its six 3.5 by 5.125 L-head cylinders cast in a single block with the crankcase continued back to include the clutch and four-speed gearbox forming a unit power plant. This plant is suspended at three points. The valves are all on the left side and are driven from a unit camshaft which is operated by helical gears. The intake manifold is a unit with the cylinder casting and the exhaust separate.

Cooling is effected by a centrifugal pump through a cellular radiator. Lubrication is taken care of by a splash pressure system in which a gear pump takes the oil from a crankcase, sends it to the main bearings under pressure and from there it flows to the splash troughs beneath the connecting-rods. Ignition is accomplished by a single high-tension system in which the battery is the current source and an Atwater Kent distributor and coil form the balance of the system. Gasoline feed is by the new vacuum system, Gray & Davis starting and lighting are used and the transmission system is comprised of a disk clutch selective gearset and semi-floating rear axle which has a double gear reduction. The drive is taken through the springs. The wheelbase is 131 inches and the tires 37 by 4.—Norwalk Motor Car Co., Martinsburg, W. Va.

Oakland Multiple Piston Rings

With a very attractive design of bodies that are a modification of the boat body lines which have appeared in Europe, the Oaklands of 1915 are mounted on either a four- or a six-cylinder chassis. The four, model 37, is a much-altered continuation of model 35 of last season, and the six-49 is the successor of the 1914 model 48. The six is reduced \$100 to \$1,685. Although the last named has not come in for much mechanical change, the model 37 is practically a new job throughout its mechanical features.

The motor operates at speeds up to 2,500 or 2,600 r.p.m., and is a 3 1-2 by 5 block type with detachable heads and gearbox in unit, and suspended at three points in the frame. Pistons have been crowned to make them stronger, multiple thin steel piston rings have been fitted and the throttle axis

of the carburetor has been arranged parallel to the center-line of the motor so as to make less restriction to gas passage and valve diameter and lift have been increased. These things have contributed to the increased power of the engine.

Delco ignition, lighting and cranking are employed, as is the Stewart vacuum fuel feed with tank at the rear. A unique feature of the four chassis is the elimination of bearings on emergency brake lever, gearshifting lever, brake rods, clutch shifter, clutch link, and so on. This is done by the use of springs and wedges, the former holding trunnions or other projections on the parts down against fixed supports and allowing them to move back and forth due to the compressibility of the spring. Thus they are prevented from vibrating, do not require oiling, and the like. Similar wedges connect brake rods to their levers, these allowing the necessary movement without bearings.

A tubular propeller shaft replaces a solid one; the three-quarter floating axle has given way to a floating construction; and the frame has been re-shaped so as to follow the body line and thus give substantial support. Underslung springs at the rear help the low-hung appearance. The wheelbase is 112 inches and tires are 33 by 4 on demountable rims.

The six-49 is fitted with either roadster or seven-passenger touring body. The motor has the same improvements as the four, and is a 3 1-2 by 5, with cylinders in block and heads detachable. Equipped with a three-speed gearset, cone clutch, uninclosed drive shaft, underslung front and rear springs, Delco combination electrical unit and Stewart vacuum fuel feed.—Oakland Motor Car Co., Pontiac, Mich.

Oldsmobile Advances Front Axle

With very little change of any kind, the Oldsmobile four and six are combined, the former having made its appearance early last year as the consort of the well-known big six. This four-cylinder car, however, has been reduced from \$1,350 to \$1,285, and besides the touring body, a roadster has been added at the same figure.

The greatest change in the big car is in the outward appearance, which has been enhanced by sloping the cowl to meet the sloping bonnet. The price has been reduced \$175 to \$2,975. This is with seven-passenger body, the five-passenger having been dropped.

Since it was first brought out, the four has had only one mechanical change, that being the shifting of the front axle 2 inches forward, making the wheelbase 112 instead of 110 inches. This brings the axle in line with the radiator instead of back of it, though it has no effect upon the body dimensions. The front spring length has been affected by the change also, these springs now being 35 1-2 inches long, 1 1-2 inches greater.

There is no alteration in the distinctive valve-in-head, block unit power plant which is 3 1-2 by 5. The most unusual feature of this engine is that all parts of valve mechanism are inclosed. An aluminum plate goes over the rockers in the detachable head, and the long rods extending up from the camshaft are in a housing integral with the cylinder casting. The Delco system, which gears to the flywheel for starting and is driven from a shaft when operating as a generator, is employed.

The clutch is a cone type, a torsion tube encloses the propeller shaft, and the axle is floating. The most striking part of the smaller Oldsmobile is the excellent finish which has been given it. The appointments and equipment leave nothing to be desired. Circassian walnut is used for the cowl dash and for the steering wheel, for example.

The big car has a 139-inch wheelbase, and the chassis has been hung 2 1-2 inches lower, which adds to appearance. The cooling system has been augmented by a larger radiator and bigger waterjackets. The motor is 4 1-4 by 5 1-4, with cylinders in threes and gearbox in unit. The Delco electrical combination is used, as are cone clutch, open drive shaft

fitted with two universals, floating axle and 36 by 5 tires.—Olds Motor Works, Lansing, Mich.

Overland Adopts Left Drive

The production policy of Willys-Overland has been broadened this year to take in three models, two fours and a six. The smaller four and the six are new.

All models have much the same general outward appearance, the bodies being of the present-day sloping hood type with cowls rounding down to the point where the bonnet begins. Although the six does not conform to the general design features of the four-cylinder engines, the final drive system is characteristically and uniformly Overland in all three. The three-speed gearbox is mounted in unit with the axle, and the propeller shaft is enclosed with a torsion tube having a yoked front end. The 1915 models are also the first to have left drive, though center control has been fitted on previous models.

One feature of the larger four and the six is the centralization of the electrical control switches in a box attached to the right of the steering column, 2 inches below the wheel. This carries the switches for all lights, for the starting current and also for the magneto. All models have electric cranking and lighting this year at the prices given, while their equipment is unusually complete.

Referring to the new six, the motor is a 3 1-2 by 5 1-4, L-head, block type, new to Overland design. Valves are on the right, compactly housed, and the cylinder head is removable allowing for ready inspection of valves and pistons. This car utilizes the Stewart vacuum fuel feed system, the tank being placed on the front of the dash and making more positive the flow from the main tank which is under the front seat. Wheelbase is 125 inches, tread 56, and rear spring suspension is three-quarter elliptic with the springs underslung from the floating axle.

The smaller four carries a characteristically-designed Overland motor with cylinders cast separately of L-head design and 4 by 4 1-2 size. It develops 30 horsepower, and is suspended at three points. Its clutch is a cone, the rear axle floating and the rear three-quarter elliptic springs underslung from it. Wheelbase is 106 inches and tires 33 by 4.

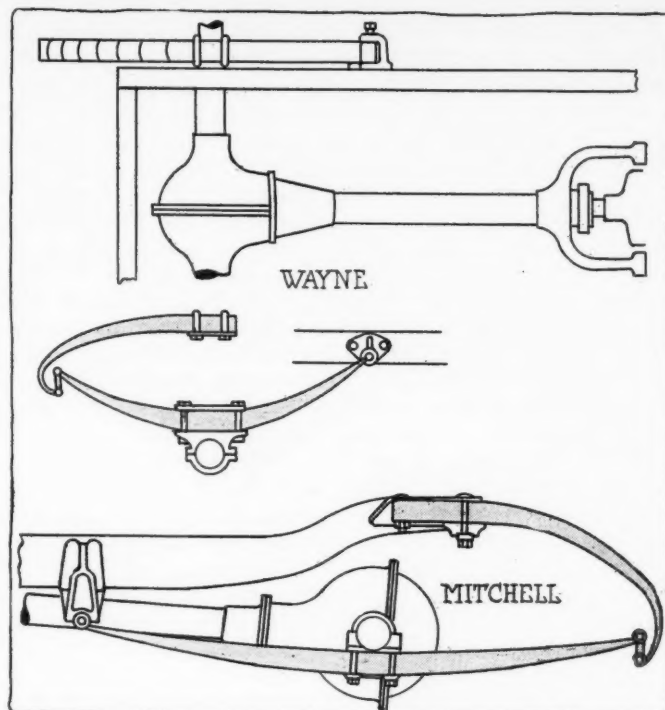
The larger four, with a similarly designed engine of 4 1-8 by 4 1-2 size, has a greatly enlarged body as compared with model 79 which it succeeds, though the wheelbase is the same, 114 inches. This greater roominess of body has resulted in larger seats, the rear now being 49 inches wide inside, and the front measures 40 inches across, and has a division.

The starting and lighting system has been remounted so that instead of driving the engine through silent chain, the starter gears to the flywheel. By underslinging the rear springs and redesigning the front axle, the body of model 80 is 3 1-4 inches lower than model 79. This model also has cone clutch and floating rear axle.

Although only a touring body is at present offered on the six, the model 80 four has roadster and coupé bodies as well as the five-passenger, while a roadster is also fitted to the smaller four. Delivery bodies may also be purchased for these four-cylinder chassis.—Willys-Overland Co., Toledo, O.

Owen Uses Entz System

R. M. Owen has incorporated the Entz electric transmission in a six-cylinder chassis which he is marketing for \$3,750 in seven-passenger touring and three-passenger roadster design. The feature of this car is the use of the electric drive which replaces the clutch and gearbox. In the Entz system of electrical transmission, the patents for which are owned by the R. M. Owen company, a generator and a motor are combined in an unusual manner. The casing of the generator which carries the fields of whole pieces is bolted to the crankshaft replacing the flywheel. The armatures of the two machines are coupled together and their connecting shaft is per-



Upper—Plan view of rear construction on Wayne. Middle—Side elevation of Wayne rear spring suspension. Lower—Rear suspension employed on the Mitchell

manently fastened to the drive shaft of the entire chassis.

The speed of the car is regulated by the throttle in the customary manner but the torque for different loads is varied by changing the field strength of the generator and on lower speeds, by sending the generated current to the motor. When the car is running along under conditions similar to high gear, for a mechanically driven car, the generator winding is short-circuited on itself and therefore, with a slight amount of slipping the heavy current is generated. This current is of sufficient strength to create a magnetic attraction between the field and the armature equal to the torque required to propel the car at that speed.

The slippage varies with the torque so that if a slight grade is encountered the difference will become slightly greater, thus increasing the voltage of the generator, which will in turn produce a stronger magnetic attraction and the torque will become greater. Seven speeds are provided.

The motor fitted to the new car is a six-cylinder Weidely 3.75 by 5.5 I-head block. It is cooled by pump water circulation, oiled by pressure and has a dynamo-battery ignition system. The electric transmission is located amidship and final drive is obtained by spiral-bevel gear to a floating rear axle.—R. M. Owen Co., N. Y. City.

Packard Alters Carbureter

Packard has the same two sixes which have been sold since last July, namely the 3-38 and the 5-48. They are very much alike in appearance and in mechanical construction, although the latter is more powerful. Both conform consistently to the general Packard outlines with the distinctive radiator and sloping bonnet meeting a cowl construction which unites body and hood. There is a long list of bodies fitted to either chassis, and they do credit to the extensive body shops of the plant.

The general chassis construction is still characteristically Packard, the design being on the two-unit principle. The main unit is the motor and clutch, and the other the rear axle assembly, comprising gearset, final drive and differential gears.

Motors are practically identical with those used in previous

cars, and are L-head types with cylinders in blocks of three. The 3-38, a 4 by 5 1-2, has an S. A. E. rating of 38 horsepower, and the 5-48 with the same stroke, has a 4 1-2-inch bore, and is rated at 10 horsepower more by the same formula.

Though of the same operative design, the carburetor body has been changed to give a housing for the auxiliary air valve, and the opening in the housing is turned to the rear to reduce the possibility of dirt entering.

A minor change which is distinctive is the use of headlamps of double design. Below the main headlight and integral with it is a smaller auxiliary headlight. This is useful for city driving or for meeting cars on the road, and is also advantageous for illuminating the road close to the car, since it is lower to the ground than the searchlights, which are better for distance. A refinement to be appreciated is the tool compartment in the left front door, which has a place for each tool. A leather flap goes over the kit.

Going into details of the 3-38, minor changes are the increasing the radiator capacity, enlarging the gearset proportions though the design is unchanged, and the increasing of the valve diameter from 2 to 2 1-8 inches.

The 3-38 wheelbase is 140 inches, and the overall length of the seven-passenger car is 187.5 inches. In the motor, the double exhaust system is retained, wherein each three cylinders gets rid of its burned gases through a separate passage, though the two passages are integral.

The Packard-Bijur system of cranking and lighting is employed and is of two-unit type, both being located on the right. The cranking motor gears 19.5 to 1 to the flywheel, and the generator, driven by shaft at 1 1-2 times engine speed, charges at 10 miles per hour, reaching its maximum at 15.

The drive is through a dry-plate clutch, then an open propeller shaft fitted with two universals to the gearbox which gives three forward speeds progressively. The axle has the new type of worm-bevel gears which give a rolling contact that practically eliminates noise. Rear three-quarter elliptic springs are underslung from the axle.

The 4-48 has a 144-inch wheelbase and incorporates practically the same design throughout as the 3-38 with the advantage of greater power. Tires are 37 by 5 all around; cooling water capacity is slightly greater, and front springs a trifle longer.—Packard Motor Car Co., Detroit, Mich.

Paige Has Cantilever Spring

The Paige-Detroit has been one of the later concerns to bring out a six, its model of this type coming to the front late last year. The entire line is made up of the six and a four.

Mounted on a 124-inch wheelbase chassis, the new six has capacity for seven in a body of advanced streamline type and is really designed along the lines of some of the European cars, its cowl having an almost flat slope to the bonnet which also slopes very slightly to the radiator. The body edges are rounded over and the upholstery is entirely inside, none protruding over the edges. The motor is a 3 1-2 by 5 1-4 unit power plant type of compact design.

Mechanical features include cantilever rear spring suspension, the spring having a 48-inch length. Drive is through multiple-disk clutch to three-speed gearset carried on a yoke which spreads around the flywheel. The propeller shaft is open, has two universals, drive being through springs and torque arm. The axle is floating and its ratio 4.07 to 1. Other features include Gray & Davis lighting and cranking, Bosch magneto, centrifugal pump cooling, left drive, center control, 15-gallon cowl gasoline tank and 34 by 4 tires on demountable rims.

The four-cylinder 36 is equipped with a 4 by 5 L-head motor of block type, with valves on the left. The gearbox bolts to a form of yoke which passes around the open flywheel similarly to the six-cylinder design in this respect. Other

motor details are positive water circulation by centrifugal pump, Bosch ignition and Gray & Davis two-unit lighting and cranking, the latter function being accomplished through gear connection to the flywheel.

A Paige distinguishing feature is the use of elliptic rear springs which make for great resiliency. The axle is three-quarter floating and its housing is of malleable construction. A gear ratio of 3.79 to 1 is used.

The cowl gasoline tank fuel system has been a Paige feature for several years, and on the later 36's the filler has been placed on the cowl board.—Paige-Detroit Motor Car Co., Detroit, Mich.

Partin-Palmer Without Change

Two models known as the 38 and 20, both of which are fours, are continued by the Partin-Palmer company. The smaller model 20 listing at \$495 with its four-cylinder L-head block motor, 2.75 by 4 inches, is a typical small car. It is mounted on a chassis of 96 inches wheelbase and standard tread with left drive and center control. The price quoted includes electric lighting with double bulb headlights and electric cranking is supplied for an additional \$75.

Ignition is by the Atwater Kent distributor in connection with current either from the generator or storage battery. Automatic spark advance is supplied in the Atwater Kent distributor. The remaining features of the car are all of standard construction. The drive is taken by a leather-faced cone clutch through a three-speed gearbox and a floating axle. Liberal use has been made of nickel steel in the gearset, differential and axle shafts. The gears are of chrome-nickel steel.

The Partin-Palmer 38 is designed along the same line as the smaller model having a 3.75 by 4.5 motor and mounted on a 115-inch wheelbase chassis. Like the smaller car it has Atwater Kent ignition, a Stromberg carburetor, and at \$1,100 is supplied with Gray & Davis lighting and starting. Without the starter the price is \$125 less. The clutch is a cone and the gearbox provides three speeds. The tires are 33 by 4. This car is made only in a six-passenger touring body, while the smaller car is made in touring and roadster form. The small roadster incorporates a rear deck which serves as a tire support.—Partin Mfg. Co., Chicago, Ill.

Paterson Increases Valve Size

A six-cylinder touring car, the first of this type to bear the Paterson name, and the four-cylinder model, reduced from \$1,197 to \$1,095, are listed. The four, which was the only chassis made last year, has the motor redesigned for greater power, though its cylinder dimensions are unchanged. In addition, it has a floating axle instead of a semi-floating type and appears with a streamline body.

Both models are sold in one touring car body type, and this is much the same in line for four and six, the latter being somewhat larger. The running boards are clear, and in the front left door there has been placed a compactly-arranged tool compartment, with a special place for each tool.

The new cars are much the same in mechanical design and are fitted with 3 1-2 by 5 Northway unit power plants which are L-heads and block cast. The cylinder heads are detachable, and the upper half of the crankcase is cast integrally with the cylinder block. They have combination Delco electrical units for lighting, cranking and ignition, are fitted with cone clutches, left drive, center control, floating axles and drive through torsion tubes which surround the propeller shafts.

Valve diameter is increased from 1 9-16 to 1 5-8 inches, and better reciprocating parts balance and lighter weight make possible the greater operative speed, which goes as high as 2,500 r.p.m. The pistons have been crowned to give them greater strength with lightness and multiple thin steel

piston rings, three to each groove, have been added as a factor for reducing to a minimum gas leakage past the pistons.

The Stewart vacuum fuel feed system is fitted to the six only. The vacuum tank is placed on the end of the exhaust manifold so as to give good gravity feed almost straight downward to the carbureter.—W. A. Paterson Co., Flint, Mich.

Pathfinder Refines Bodies

Few changes of a mechanical nature are to be found on the two sixes which will make up the 1915 Pathfinder line. They are the same two sixes as were marketed last season with a number of body refinements. These changes are principally to be noted in the roadster, which is a new streamline design having a covered rear compartment fitted with a little door through which packages may be inserted. The rear compartment also contains folding seats for two extra passengers. The larger goes under the name of Leatherstocking, while the smaller is known as Daniel Boone. The Leatherstocking is made only as a seven-passenger, and the Daniel Boone in seven-passenger and roadster style. For this season Westinghouse lighting and starting is used.

These cars carry the Continental six-cylinder power plants of 3.75 by 5.25 and 4.125 by 5.25 inches respectively. The design of the two models is similar, both being L-heads with the cylinders cast in threes. They both have inclosed valve mechanism and three-point suspension. No changes in prices have been made, although both cars have been considerably refined as regards their bodies and equipment. The five-passenger touring Leatherstocking sells for \$2,750; the Daniel Boone \$2,222.—Motor Car Mfg. Co., Indianapolis, Ind.

Peerless Lightens Chassis

In addition to the continuation of its big model 48-six, the Peerless company has brought out a much lighter four and six, calling them all-purpose cars. These new cars present attractive outward appearances, being of the streamline form. Practically the same design holds for the four and the six, though the latter has certain larger dimensions, naturally. One body feature which is new is the dividing of the front seats into individual armchair types, a passage running between them, giving access to the tonneau.

The motors conform to the same general design throughout. They are of the L-head, unit power plant construction, carried at three points. In both cases the cylinders are in block form, and dimensions are nearly the same. The six has a 3 1-2-inch bore and the four is 3 3-4, but the stroke is uniform at 5 inches. Ratings are 29.4 and 22.5 horsepower, respectively, by the S. A. E. formula, but the engines are said to attain 2,000 r.p.m. when the developed power is 38 and 50.

Stromberg carbureters are fitted, and ignition is by Atwater-Kent Unisparker system. The motors carry Kellogg single-cylinder tire pumps, driven from the generator shaft, as well as Stewart vacuum fuel feed tanks. Gray & Davis cranking and lighting are also used, there being separate cranking motor and generator, the latter being driven by a shaft from the front gears, and the former drives the engine through gear connection to the flywheel. An 80-ampere Willard battery is a part of the system.

Throughout the drive, modern features are in evidence, such as open drive shaft of two-universal type which is of tubular form in the center. Its power comes through a multiple-disk clutch, and it delivers it to a semi-floating axle, the main housing of which is reinforced pressed steel. Platform rear spring suspension which has always characterized Peerless cars is in evidence on the new pair. Tires of both cars are 34 by 4, and the six wheelbase is 121 and the four 113 inches.

The big six, model 48, carries a 4 1-2 by 6, T-head engine

with cylinders in pairs, has Bosch ignition, Peerless carbureter, Gray & Davis cranking and lighting, and splash lubrication. Its wheelbase is 137 inches, driveshaft fitted with two universals, and floating axle. The rear spring suspension is of the platform type. Tires are 37 by 5, and options of right drive and control, or left drive with center control are allowed. The prices remain \$5,000 for touring car, and \$4,900 for roadster with all equipment and up-to-date bodies.—Peerless Motor Car Co., Cleveland, O.

Peter Pan Has Cantilevers

Peter Pan is the name given to the new car put out by the Randall company. It is made in four-passenger touring and two-passenger runabout bodies on the same chassis. The wheelbase is 110 inches and although this length is as great as in some of the heavier cars, everything about this new product has been made along light lines.

The four-cylinder power plant has its 2.75 by 4.5 cylinders cast in a single block with the valves in the head. Cooling is thermo-syphon through a tubular radiator. A Berling magneto is the sole source of current for ignition and for starting a mechanical device is relied upon.

A multiple disk clutch transmits the drive through a three-speed selective sliding gearset. Control is in the center and the steering wheel on the left. The springs are floating cantilevers and the brakes, as regards the service set mounted on the transmission shaft, with the emergency brakes on the rear wheel. The bodies are streamline adaptations and carry out the up-to-date scheme of deep upholstery and full equipment.—Randall Co., Norfolk Downs, Mass.

Pierce Drops Chassis Frame

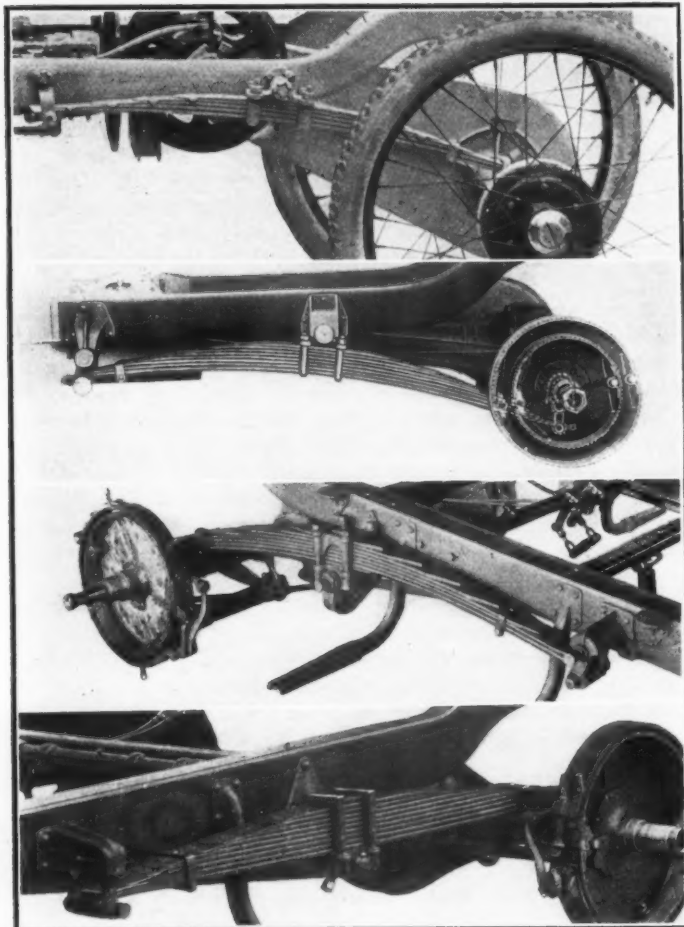
Only one change of any importance has been made in the primary design of Pierce-Arrow cars. This has been a drop in the central portion of the frame. With this single change the entire appearance of the new line has been altered and in connection with its adoption it has been necessary to make one or two other minor alterations. The first of the latter is the abandonment of the gravity gasoline feed and the substitution of a pressure system with the tank at the rear of the chassis. In turn the adoption of pressure has rendered possible the raising of the carbureter with a consequent shorter intake manifold.

With but one exception no change has been made in the prices. The largest limousine on the 66 chassis, which is the largest of the three sixes which compose the Pierce line, has been reduced from \$7,100 to \$7,000. On account of the drop of the frame which has been made on all three models it has been found possible to lower the bodies and running board without reducing the road clearance.

There are also a number of other minor changes for the convenience of the driver. The control members, including the excellerator, throttle and spark control, have been simplified. The engine cannot be started if the bonnet is locked and the key removed from the ignition switch.

Fifty-four body types and an unlimited number of color schemes is the Pierce offering in the way of carriage work. In addition to the different body designs and the general improvement in appearance because of the drop frame the Pierce company states that the new models have more power, better pick-up and higher speed because of the pressure feed gasoline system. The new fenders are wider, a one-man top has been fitted and individual front seats are provided on the regulation touring cars.

All three Pierce-Arrows are built along similar lines. The chassis are known as 65 A-3, 48 B-3 and 38 C-3. The power plants are 5 by 7, 4.5 by 5.5 and 4 by 5.5 inches. All have their cylinders cast in pairs and the T-head design has been maintained to provide for the large valve area with the shortest possible over-head length. Seven bearing crankshafts are used and on the camshafts the cams are pinned



Top—Side view of rear of McIntyre Imp chassis, showing friction drive and cantilever rear spring

Upper Middle—Cantilever spring suspension used on rear of Pathfinder

Lower Middle—Type of Cantilever employed for rear suspension on the Paige-Detroit

Bottom—Cantilever rear spring on the National

to the shafts. The electrical equipment is provided by Westinghouse.—Pierce Motor Car Co., Buffalo, N. Y.

Pilot Adds a Six

Three sixes are made by the Pilot Motor Car Co. One of these, the 55 is an entirely new addition to the line and takes the place of the four manufactured for the 1914 season. The other two, known as the 75 and 60 are continuations.

The new six is the Pilot leader for this season. It is built on a chassis of 126-inch wheelbase and is provided with either two or five-passenger body and at an additional price a seven-passenger. It has a 3.5 by 5.25 T-head power plant and is fitted with the popular cantilever springs. The 75 has a 4.5 by 6 and the 60, a 4 by 6 T-head motor. The wheelbases of these two are 132 inches.

Chrome nickel steel piston pins secured in the upper ends of the connecting-rods, are used. The bosses in the pistons provide the bearing surface and the makers claim that by so doing they have gained a higher percentage of bearing surface as compared with the practice of fixing the pins in the piston boss. Drop forge carbon steel connecting-rods and crankshafts are used and the bolts holding the connecting-rod caps in place are nickel steel. The aluminum crankcase carries the main bearings on bridges allowing bearings adjustment to be made by dropping the bottom pan of the motor. The bearing material is die-cast nickel babbitt.

A patented lubrication system is used on all Teetor motors, the Pilot being fitted power plants of this make. There

are two overflow oil basins into which the connecting-rods dip, these being fastened in the lower half of the crankcase. In the bottom of these two oil troughs there are drilled oil holes which are of just sufficient size to admit a definite quantity of lubricant. As the oil is circulated by the connecting-rods it is replaced by the oil supplied through these holes giving a system which is claimed to feed in a direct ratio with the motor speed. The reservoir is in the bottom of the crankcase.

The clutch and gearbox are Warner products. The clutch is a cone and the gearbox provides three speeds. They are contained in a unit housing forming a unit power plant. The drive shaft has two universals and the axle is floating.—Pilot Motor Car Co., Richmond, Ind.

Pratt Concentrates on a Six

The Elkhart company, makers of the Pratt automobile, are concentrating on a new six which they have just brought out. This is the sole model made by this concern for 1915. This chassis will be equipped with five different body designs, a two-passenger, four-passenger, five-passenger and seven-passenger. It has a 3.75 by 5.25 Continental motor in a unit power-plant with three-point suspension. The gearbox provides four speeds and is of Brown-Lipe manufacture. The carbureter is the latest Rayfield.

The drive is taken from the gearbox by a horizontal shaft with a Spicer universal joint at either end. The rear axle is a Timken and full Timken equipment is also provided in the front axle. The electrical equipment of the car consists of a Gray & Davis starting and lighting system with battery ignition through an Atwater Kent distributor.

Left drive is used and center control, the gearshifter lever being mounted directly on the cover of the gearbox. The equipment of the car is complete, non-skid tires being furnished for the rear and a one-man top, keyless clock, bumper rail, power tire pump are also included. The body is of streamline characteristics provided with wide doors.—Elkhart Carriage & Harness Mfg. Co., Elkhart, Ind.

Premier Continues Weidely

The six-cylinder overhead-valve Weidely motor still is featured by the Premier Motor Mfg. Co., Indianapolis, Ind., while a second car in the line is the model 6-49 equipped with a T-head engine. The substitution of long semi-elliptic rear springs for three-quarter elliptic is the only change made for the year.

In the Weidely motor the valves are set directly in the cylinder head, getting away from valve cage construction. No rocker arms are used but instead a single camshaft is mounted above the valves and the shaft operated by worm gearing. The worm gear is attached to the center of the camshaft and another gear in mesh with it is fastened to a vertical shaft which is driven directly from the crankshaft.

The valve stems are not touched directly by the cams, but what are called fingers are placed between the two. These fingers merely are levers pivoted at one end and move up and down with the movement of the valves.

The wheelbase of the Premier-Weidely is 132 inches, the clutch a disk, and the gearset a three-speed selective driving an open shaft to a floating axle. Remy cranking and lighting is used but ignition is by an Eisemann instrument. Three body styles are offered, a roadster, and a five-passenger at \$2,700 and a seven-passenger at \$2,750.

The 6-49 Premier has a T-head, 4 by 5 1-2 motor which develops unusual power, the figure being 70 horsepower maximum, it is claimed.

Triplet casting of the cylinders is used and the blocks are set close to one another so as to decrease the crankshaft length and hence the distance between bearings for the sake of rigidity. In the top of the castings there is the camshaft chamber which is completely covered by an aluminum plate

which seals the upper ends of cylinder water jackets.

The drive is similar in design to that of the Weidely chassis. In five-passenger form this car sells for \$2,385.—Premier Motor Mfg. Co., Indianapolis, Ind.

Pullman 4 Inches Longer

Two models, a six and a four will compose the Pullman line for this season. The six, is the 6-48 in practically the same form as was introduced at the 1914 New York show. The four, is an entirely new model and will be known as the junior.

Some refinements have taken place on the six, the main one being the increase in wheelbase of 4 inches, bringing it to 134. This of course has necessitated a larger body and a strengthening of the spring suspension although in general the car is of lighter structure than for last season. The larger body has been utilized to provide 2 inches more in the driver's compartment and 6 inches more in the tonneau. The seats have been widened and deepened and the rear doors carried back further. The dash is now covered with leather and the instrument for the 12-volt electric system mounted on the cowl board. The radiator is lighter but has a larger cooling capacity and the price remains the same with Vulcan electric gear shifting at \$150 extra.

The new Junior model has been made to meet the demands for a light four-cylinder vehicle selling at a low price. The price in either touring or roadster design being \$740. The motor is an L-head block with 3.75 by 4.25 cylinder with the valves on the left side. The crankshaft is carried on three plain bearings and the camshaft driven by silent chain. The motor clutch and gearbox are included in a unit housing and suspended at three points. Cooling is by thermo-syphon.

The gearbox provides three speeds with a ratio of 4 to 1 on direct. The steering wheel is on the left side and the control in the center. The rear spring is a cantilever, the wheelbase 110 inches and tires, 33 by 3.5.

The power plant of the six has its cylinders cast in threes. It is an L-head 3.75 by 5.25 design of which the makers claim 38 horsepower at approximately 1,500 r.p.m. on the block. The clutch is a multiple disk and is a part of the unit power plant. Lighting and starting is taken care of by the Westinghouse system and the dash equipment is carried on a cowl board. The 20-gallon gasoline tank is mounted beneath the cowl.—Pullman Motor Co., York, Pa.

R. C. H. Improves Equipment

A five-passenger touring car of streamline appearance represents the R. C. H. for 1915. The body lines are unaltered, but the front seat has been moved 1 inch further back, so as to give more leg room. In the equipment, a one-man top supplants the older style with forward and rear supports. Mechanically, the car is unchanged.

The R. C. H. has a 3 1-4 by 5 block-cast L-head engine. The cone clutch is provided with a brake that applies automatically when the pedal is pressed, thus stopping it from spinning, facilitating gear changes without clashing. The gearset is of the three-speed type, and delivers its power to a rear axle having a reduction of 4 1-4 to 1. The wheelbase is 110 inches and this allows room for a comfortable five-passenger body. The running boards are clear, door hinges and handles are concealed and the equipment adds to the whole. Among this may be mentioned rain-vision ventilating windshield, 32 by 3 1-2-inch tires on demountable rims and speedometer.—R. C. H. Corp., Detroit, Mich.

Regal Drops Underslinging

Concentration upon the construction of one overslung chassis is the 1915 policy of the Regal company, this being a new model. The underslung model sold in 1914 has been dropped. Thus the new chassis marks the passage of the

underslung construction from the Regal shops, the same low center of gravity now being obtained by springs hung from the under side of the axle. The new Regals are fitted to a 112-inch wheelbase, and bodies are of the sloping hood and cowl type, fenders being domed and running boards clear. Wide doors with concealed hinges and latches do their part in appearance.

The motor, 3 3-4 by 5, is a block type L-head form with cylinder head detachable and exhaust manifold cast integrally with the main casting. This engine is 150 pounds lighter than that of last year's underslung car. Better balanced and lighter reciprocating parts are one factor, and the use of a steel stamped lower crankcase portion in place of a cast iron type is another. The use of multiple thin steel piston rings is a new feature.

Spark and throttle levers have been replaced on the steering wheel. Atwater Kent ignition of automatic advance type makes a spark lever unnecessary, and control of the carburetor is mainly by the accelerator. However, a hand lever control is placed on the cowl dash so that the engine may be set at any desired minimum speed.

An innovation is the placing of the radiator filler cap under the hood; it now being a part of the outlet connection from the waterjacket. This prevents spoiling the hood and radiator finish by spilling water on it.

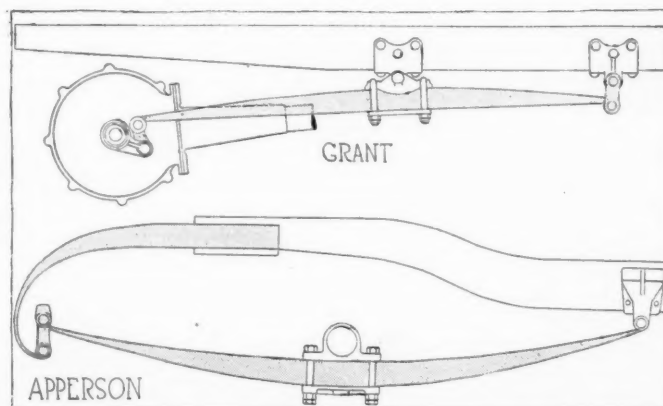
A Bosch-Rushmore two-unit system of cranking and lighting is employed, the cranking motor gearing to the fly-wheel, whereas the generator is carried on the right forward side of the engine and has a unique belt drive. A pulley on the end of the crankshaft runs over both the fan pulley and generator pulley and provision is made for adjusting its tension.

A three-quarter floating axle with 4 to 1 ratio replaces a heavier half-floating type used on former Regals, the front axle being also lighter. Tires are 32 by 4.—Regal Motor Car Co., Detroit, Mich.

Remington a New Light Four

The Remington four-cylinder chassis makes its appearance this season in roadster and touring bodies. The chassis upon which both cars are mounted is the same with the exception that 30 by 3.5 tires and demountable rims are used on the touring, while the roadster has 30 by 3 tires with clincher rims.

The motor is a four-cylinder block-cast 3.125 by 4 unit power plant with three-point suspension. All the valves are on the right side and are enclosed by a detachable cover plate. The valve diameter is 1.5 inches in the clear with a 3-16-inch lift. The piston length is 4.5 inches, connecting-rods 10.5 inches, with a .875-inch piston ring of 1.75 inches length. The crankshaft is carried on two main bearings and has a diameter of 1.75 inch. The camshaft is also carried on two bearings and has a 1.25-inch diameter.



Upper—Diagram of cantilever spring suspension employed on the Grant. Lower—Similar illustration of the Apperson rear suspension

Lubrication is accomplished by splash, ignition by the Atwater Kent distributor system and starting and lighting by Ward Leonard installation. The clutch is a cone and the gearbox provides three speeds operated by an automatic gearshifter. The spark control is also automatic having the centrifugal arrangement in the distributor.

The rear axle is a three-quarter floating type with bevel gear differential made of nickel steel. The bearings in the rear axle are Hyatt high-duty type while in the front wheels the Bower rollers are used. The front axle is an I-beam drop-forged. The wheelbase for both cars is 106 inches.

Both the touring and roadster bodies are fully equipped. The dash is of Circassian walnut with all the instruments mounted upon it. A long cowl is used and advantage is taken of its length to house the gasoline tank which has a capacity of 12 gallons. In the touring body a robe rail formed by an adjustable strap is used.—Remington Motor Co., New York City.

Reo Adds a Six

The Reo Motor Car Co., Lansing, Mich., which has always been regarded as a one-model concern with its four-cylinder Reo the Fifth as its sole representative, has this year placed upon the market a six, in addition to continuing the four in improved form. In general, the new Reo adheres to the same design as that of the four, and is characteristically a Reo throughout.

Some of the special constructional features of this new six, which has 122-inch wheelbase, are the spiral-bevel gears used in the floating rear axle and the cantilever rear springs which are attached to the frame and axle housing in the regular way. In addition to body improvements in the Reo the Fifth which make for better upholstering and more roominess, there are such important alterations as the increase of the wheelbase from 112 to 115 inches, the use of a new cylinder design with independent exhaust ports, the addition of friction surface to the disk clutch, the non-rattling support of the brake mechanism and the improved starting mechanism doing away with shifting of gears.

The motors of both Reos adhere to the distinctive construction characteristic of these engines wherein the inlet valves are placed in the head and the exhausts on the side. The six is a 3 9-16 by 5 1-8 engine with 40 to 45 horsepower rating and cylinders in threes. The four has 30 to 35 horsepower with 4 1-8 by 4 1-2-inch cylinders in pairs. Crankcases are of the barrel form of aluminum, and helical timing gears are employed as well as exhaust manifolds of the ejector type which reduce the back pressure. Crankshafts and camshafts are supported on three bearings.

Ignition, cranking and lighting for the two models is uniform, the ignition distributor being combined with the generator with the storage battery as its source of current. The starting motor connects in the gearset to the mainshaft through worm gear construction.

The clutch used is a dry disk type which is changed from that formerly used by giving it more friction surface, and by a new operating mechanism which requires less foot pressure.

Streamline hub caps, so called are fitted on the new Reos. These are simply smooth, domed housings for the spindle nuts which are held in place by a set screw to coincide with the lines of the body.

The drive construction of the six terminates in a floating rear axle, while that of the four is semi-floating. The brake rods and parts are fitted with anti-rattlers which aid in silencing the cars. Gearsets are of the three-speed, selective design and gasoline tanks are carried under the front seat, feeding by gravity.

In addition to standard equipment, the six carries a motor-driven tire pump driven from the clutch shaft with the hose permanently connected to the pump and placed in a special

compartment in the body.—The Reo Motor Car Co., Lansing, Mich.

Republic Adopts Vacuum Feed

The Republic line of one model is continued without change as far as the makeup of the output is concerned. Several detail changes are worthy of note, particularly in the employment of the new vacuum feed system for gasoline and in the adoption of the Rayfield carburetor as standard equipment.

The power plant remains the same in every respect, the six T-head cylinders being cast in pairs. The dimensions of the cylinders are 4.25 by 5. The water is circulated by a pump, oiling is by a pressure system in which a gear pump takes the oil from the crank case and forces it under pressure to the main bearing. From these points it is carried through the drilled crankshaft to the lower connecting rod bearings.

The entire electrical equipment is furnished by Delco. This is a dual system and not only takes care of ignition but also of lighting and cranking. The wiring is double and the voltage of the system, 7.

The clutch is a leather cone in the flywheel and the gearset is a four-speed selective located amidships. Final drive is by shaft to a bevel gear, floating rear axle which delivers the propulsive thrusts through radius rods. The wheelbase remains the same as last year at 133 inches.—Republic Motor Car Co., Hamilton, O.

Saxon Six Introduced

From the enlarged factory of the Saxon company, a six-cylinder machine is now coming forth which sells at \$785, this in addition to the four-cylinder roadster in improved form at \$395. The six is seen for the first time at the show, and is said to be the lowest priced six in the field. Factory expansion has resulted in the plans of the company to double its output of the four, in addition to building 25,000 of the sixes, on which the price is based.

The two Saxons adhere to the same general construction throughout, though the six has larger proportions and certain differences incident to its greater power and weight. The motors are L-heads, cast in block with multiple, dry disk clutch in unit. The six has a 30 to 35 horsepower motor, 2.875 by 4.5, and the four-cylinder is a 2.625 by 4 size. They have Atwater-Kent ignition, thermo-syphon cooling and fuel feed by gravity from gasoline tank carried in the cowl.

Other features include gearset in unit with the rear axle and cantilever springs all around. The six is provided with three forward speeds, while the four has two, and another difference is in the type of rear axle, that of the little car being a semi-floating construction whereas its bigger brother is fitted with a three-quarter floating design.

Brakes are on the rear wheels, operating in the usual way through pedal and lever. Steering is on the left and control in the center. Hyatt bearings play an important part in the rear construction of both cars.

The six has an unusually long wheelbase for a car of its price, the figure being 112 inches. The four is of 96-inch wheelbase. Tires are 28 by 3 on the four, and 32 by 3 1-2 on the six.

The six, which comes in five-passenger touring car form only, is well equipped. It has Gray & Davis electric lighting and cranking equipment, demountable rims, top, windshield, electric horn, speedometer, one extra rim, tools and tire irons at the price. To give some idea of the roominess of the body, the front seat is 41 inches wide; the rear seat 47 inches; and the distance from the heel board to the dash is 28 inches.

The four-cylinder car, which is a roadster only, is fitted with electric lighting and cranking at \$70 additional. This is a refined car as compared with the original Saxon brought out about a year ago, and appeared in its present form the

latter part of last July. Larger body of streamline form, which is roomier and better-looking, and full running boards now grace this Saxon. Small changes include the placing of the gasoline filled plug on the dash instead of under the bonnet where it was inconvenient to get at, and the fitting of a three-hinged hood in place of the single-piece design. Headlights have been moved from the sides to the front of the car.

As compared with the original car, there is refinement in the rear axle also. Felt washers have been provided which prevent the oil from working out onto the brakes, and an oil filler in the differential carries the lubricant direct to the bearings. A through pin for locking the differential pinion carrier replaces a set screw.

The equipment takes in top, windshield, acetylene headlights, oil tail lamp, gas generator and horn.—Saxon Motor Co., Detroit, Mich.

Scripps-Booth Drops Cyclecar

To succeed the cyclecar which it brought out about a year ago, the Scripps-Booth Co., Detroit, has designed what may be regarded as one of the most luxurious types of automobiles in its class. This car as a roadster sells at \$775 and is fitted with a four-cylinder 2 7-8 by 4 motor, has 110-inch wheelbase and is mounted on 30 by 3 1-2 tires.

Its equipment is of the most modern type, including motor-generator for lighting and cranking, Houk wire wheels with one extra carried on the rear deck, electric door openers, electric horn, 9-inch Turkish upholstery, attractive windshield, silk-mohair top and curtains.

Made with an option of three treads, 40, 56 and 60 inches, the chassis make-up takes in a cone clutch, three-speed gear-set in unit with the motor, double rear wheel brakes, floating rear axle, tubular drive shaft, semi-elliptic front and cantilever rear springs and a frame which narrows to both front and rear in order to follow the curve of the body and thus give rigid support to it.

The S. A. E. rating of the engine is 13.25, but 19 horsepower is claimed for it. It is a high-speed type of power plant, running as high as 2,750 r.p.m. without much drop in the power curve. Silent operation has been attained by special cam design which allows the valves to drop within 1-1,000 inch of their seats and then slowly lets them down the remaining minute distance. The cylinders and crankcase are cast in one piece, and the head is detachable. It carries the valves and their rockers together with the passages to the intake ports. Two main bearings support the crankshaft, and three carry the camshaft.

Lubrication is of the circulating splash type, ignition is cared for by Atwater Kent distributor and cooling is by thermo-syphon. The motor-generator for lighting and starting is hung from an integral bracket on the right side of the crankcase. It connects to the crankshaft through silent chain, the sprocket for which is just ahead of the flywheel.

The car has a leather-faced cone clutch from which the power goes to the rear through a three-speed gearset in which unusually large gears with a 5-8-inch face width are employed. The tubular propeller shaft is 1 1-4 inch in diameter, and the drive is taken through the springs, a torque arm taking the torque.

Unusual features are the use of pedals for operating both sets of brakes, the clutch pedal taking care of the service set in addition to performing its clutch function. Steel cables take the place of rods for working both sets of brakes.

Push buttons placed close to the doors operate the latches magnetically, which is a point new to motor car body building. Throughout the car the aim of the designer has been to show that luxury may be had in the small car as well as in the more expensive. The idea is to make a car that will be approved by the fastidious.

Drive is on the left by a 16-inch walnut wheel, and control

in the center. Besides the roadster body, a cabriolet and a coupé are fitted to the same chassis.—Scripps-Booth Co., Detroit, Mich.

S. G. V. Has Larger Chassis

One chassis upon which all types of bodies are mounted is made by the S. G. V. company. This is an entirely new model and has a 3.875 by 4.325 motor as compared with the 3.75 by 5 motor introduced last season. The new car has its four L-head cylinders cast in a single block with the valves on the right side. The single integral camshaft is driven by a silent chain and the valves are inclosed, giving a clean exterior appearance. Both the intake and exhaust manifolds are cast separately from the cylinder, the exhaust being ribbed according to the European practice which this car closely follows. The motor is supported at 4 points.

A centrifugal water pump in connection with a cellular radiator cools the motor and the fan is formed by the spokes of the flywheel. Another point at which European practice has been followed is in the pressure feed lubricating system in which a gear pump forces oil to every bearing even to the piston pins. Ignition is by a single system, a Bosch insulation with one set of plugs taking care of this function. The carburetor is 1.25-inch Zenith fitted with hot-air pipe and taking its feed by pressure from the 20-gallon gasoline tank located at the rear of the chassis. The Ward Leonard system is provided for lighting and starting.

The transmission system is made up of a disk clutch selective sliding gearbox providing four-speeds and a semi-floating rear axle with a bevel gear differential. The drive is taken through the spring. The wheelbase on the new model is 118 inches, the tires 34 by 4 and the tread standard. The body work is of European style especially insofar as the closed cars, namely, Limousine, brougham, landaulet and landau are concerned.—S. G. V. Co., Reading, Pa.

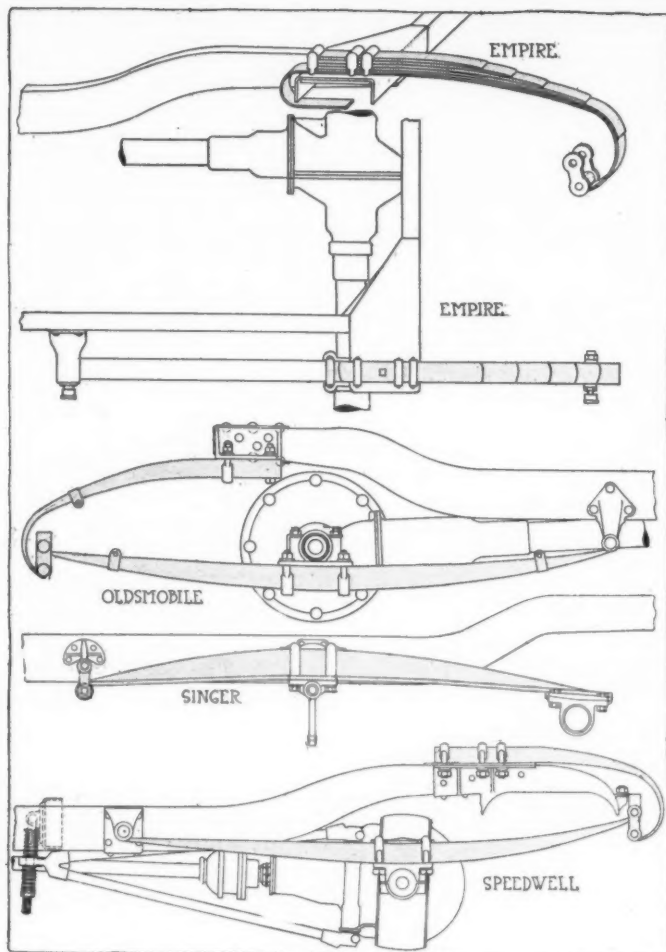
Simplex Has Three T-Heads

Simplex cars continue to be made in three chassis; a 38 shaft drive, a 50 inclosed chain or shaft drive and a 75 inclosed chain or shaft. The numbers serve to indicate the maker's horsepower rating as well as the model. The Simplex company manufactures only the chassis, the bodies being subject to order.

All three Simplex models have T-head motors supported at four points, dry disk clutches located in the flywheel and four-speed gearboxes mounted amidship and supported at four points. The 38 is a 4.875 by 6.5 with its cylinders cast in pairs, the manifolds are cast separate with the intake on the right and the exhaust on the left. The motor is water-cooled, a honeycomb radiator being used in connection with a centrifugal pump. Dual ignition is used. A Bosch high tension magneto being used as the current source. The balance of the electric equipment is a Bosch Rushmore outfit of the six-volt type operating with a single wire installation. The 28-gallon gasoline tank is operated by a pressure system and a Simplex carburetor is used as the vaporizing medium. A shaft with bevel gear reduction of 2.75 to 1 on fourth speed is used and the drive is taken through a torsion tube. The wheelbase of this chassis is 137 inches.

The 50-horsepower model which was new last year has been continued without change. It has a bore of 5.375 and a stroke of 6.5 inches. In general design it is similar to the smaller model described. The only difference is that if desired, a chain drive will be fitted. When the latter is the case, the propulsion is taken through radius rods while as with shaft a torsion tube serves this purpose.

The 75-horsepower model has the same sized cylinders as the 50 and in fact is the same throughout as the latter except tuned up for racing. The valves are larger. A steeper set of cams is used and a dual-double ignition system with two sets of spark-plugs are provided. Chain drive was of-



Top—Side view of novel method of securing rear spring through the main leaf, as used on the Empire. Upper Middle—Plan view of the same construction. Middle—Side elevation of Oldsmobile rear spring arrangement, showing method of bolting to frame. Lower Middle—Cantilever spring used on the Singer. Bottom—Rear construction of the Speedwell, showing ingenious utilization of frame end for supporting spring shackle

fered in 124-inch wheelbase and chain or shaft in 137.—Simplex Automobile Co., New Brunswick, N. J.

Singer Has Cross-Head Piston

The Singer Motor Co. which has recently been formed has brought out a six-cylinder car fitted with a 4 by 5.5-unit power plant suspended at three points, dry-plate clutch and four-speed gearset with direct on fourth. The wheelbase is 135 inches and the tires are 36 by 45. A feature of note is the unusual method of marketing the car which will be directly from the factory to the consumer.

The large power plant which is a T-head design is stated to show 100 horsepower at 2,000 r.p.m. on the dynamometer; an advantage has been taken of this high power by gearing the direct drive 3.66 to 1. In the actual construction of the motor the cross-head pistons are the only departure from standard practice as far as the internal structure is concerned. On the exterior of the motor the novel design of the intake manifold will be immediately noted. Both the carburetor and the manifold are water-jacketed but the latter is especially notable for the large radius of its turns and the diameter of the pipe, which takes a 1.75-inch C. R. G. carburetor.

The exhaust manifold is designed with interior walls to avoid in any way difficulties which might be experienced by two cylinders exhausting at the same time.

The method of fastening the steering drop arm is a departure from standard practice, the hub being pierced with

triangular slots corresponding to a similar opening in the shaft to which it fits. The shaft is then tapered so that adjustments for wear may be made by tightening the nut holding the arm in place. This is a patent of the Jacox company. The gear itself is a worm and nut having a 2-inch column and a 19-inch wheel.

A distinctive type of streamline body having unbroken lines from the pointed radiator to the moulded surface at the rear of the tonneau is fitted to the chassis. Left drive with center control is used and the one-piece design is carried out in such parts as the windshield, which is built into the cowl. The various instruments are carried on a cowl board and a fire extinguisher is an unusual addition to the equipment.—Singer Motor Co., Long Island City, N. Y.

Spaulding Underslung Rear

The single four-cylinder model H Spaulding chassis is continued with a number of improvements chief among which are the placing of the rear springs underneath instead of over the axle and the fitting of a body with more graceful lines. Aside from these changes the car is practically the same as before being fitted with a touring body which can be converted into one with sleeping quarters sufficient for five persons. This is done in a few minute's time by dropping the hinged back of the front seat. An electric reading lamp is provided in the compartment so as to make the improvised hotel room comfortable.

The chassis has a 120-inch wheelbase and is fitted with a Buda motor, 4 1-4 by 5 1-2. Ignition is by Simms magneto and cranking and lighting by the Entz system. The gasoline feed used is a pressure gravity system in which fuel is forced from a container at the rear to an auxiliary tank on the dash and thence to the carburetor by gravity.—Spaulding Mfg. Co., Grinnell, Ia.

Speedwell Has Rotary Valve

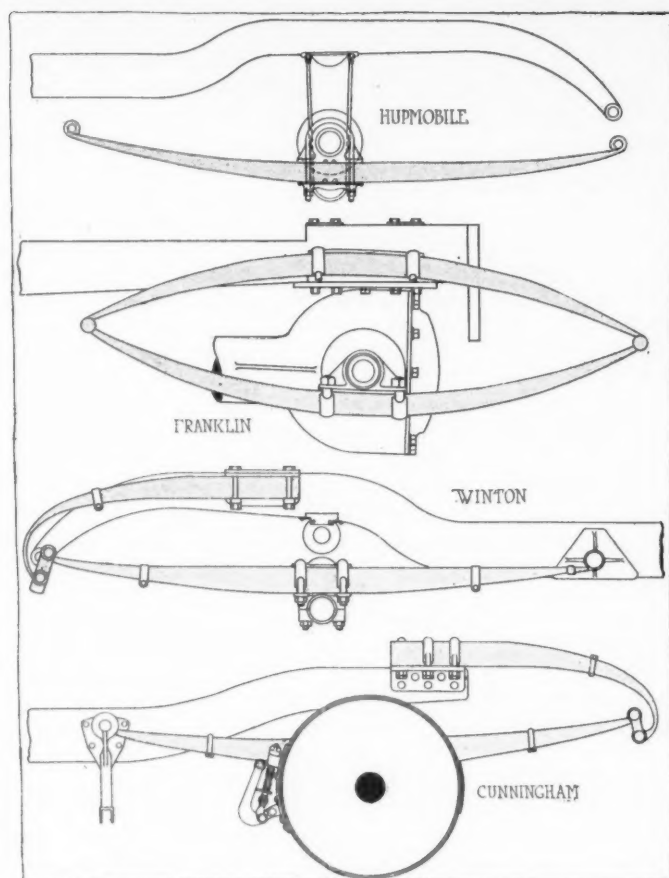
The Speedwell is continuing a single six-cylinder chassis fitted with a Mead rotary-valve motor, with only slight changes over the former model. The changes are, the adoption of the Westinghouse cranking, lighting and ignition system instead of that used previously, a Stewart vacuum gasoline system and changing the position of the instruments from the floorboards to a cowl dash.

The Speedwell is fitted with a Mead-type rotary-valve motor in which there are two valves for the six cylinders one on each side of the cylinder block. Each valve contains six slots and these register with slots which communicate with the inlet and exhaust manifolds. In order to assist in the lubrication of these valves they are grooved longitudinally and between adjacent cylinders the valve is fitted with a ring so that there will be no leaks from one cylinder to the other. The valves are made of gray iron and the cylinders of semi-steel so that wear will be reduced. Aside from the valve arrangement and the necessary changes in cylinder design, the motor shows no radical construction. Its dimensions are 4 1-8 by 5 1-4 and it drives through a disk clutch and three-speed gearset, a unit with it, to a Timken floating axle.

The Speedwell rotary is made with three body types, a four-passenger at \$2,850, a five-passenger at the same price and a seven at \$2,950. A six-passenger also is made by adding two auxiliary seats to the four. The chassis has a 135-inch wheelbase and tire sizes are 37 by 5 for the six and seven-passenger and 36 by 4 1-2 for the others.—Speedwell Motor Car Co., Dayton, O.

Sphinx Makes Light Four

A newcomer for this season is the Sphinx, a light four-cylinder car with a five-passenger streamline body mounted on a 112-inch wheelbase and having a four-cylinder monoblock power plant, three-speed gearbox and a roller bearing



Top—Diagram of spring suspension used on the Hupmobile. Upper Middle—Full elliptic spring construction used on the Franklin. Lower Middle—Winton's method of attaching spring to side member of frame, showing use of frame end for shackle support. Bottom—Cunningham rear suspension

rear axle. It is thoroughly equipped with electric lighting and starting, and wire wheels may be had for \$25 extra.

The motor has its 3.375 by 5 L-head cylinders cast with a detachable head. The power plant is featured by light-weight reciprocating parts and throughout is of high-speed design. The valves are of the orthodox 45-degree poppet type, having a diameter in the clear of 1.375 inches. The crankshaft is a 0.40-carbon steel alloy carried on two main bearings. The diameter of the crankshaft is 1.75 inches.

In connection with the generator a battery system of ignition is used, the high-tension distributor being operated from a vertical worm-driven shaft. Lighting and starting are accomplished by a single-unit motor-generator.

The lubricating system is a circulating splash, the pump being driven from a cam off the camshaft. A 1-inch carburetor fitted with hot-air intake and a shut-off valve for starting, is fed by gravity from a 25-gallon gasoline tank.

A 12.5-degree cone clutch, having a chrome leather facing with spring and plunger inserts for gradual engagement, transmits the power to a three-speed Covert gearbox located on the rear axle. The drive shaft, countershaft, and dog clutch of this gearbox are carried on roller bearings. The rear axle is a Weston-Mott carried on Hyatt bearings and the front axle is tubular with cup and cone ball bearings in the hubs. Control is central with the steering wheel on the left. The clutch and service brake are both operated from the left pedal. The emergency brake by the right pedal thereby eliminating all but the gearshifter lever.—Sphinx Motor Car Co., York, Pa.

Stearns Has Small Knight

The new four-cylinder Stearns-Knight type at \$1,750 is one of the more interesting cars because this is a price almost

\$1,000 under any previous Stearns-Knight type and also the low mark for a Knight sleeve-valve motor in this country. While the trend was toward sixes Stearns has been one of the several to bring out a small four in preference to a small six. This new model with 3.75 by 5.625 block cast cylinders incorporates many new, yet tried, features in motor-dom, including the crankshaft with counter balance weights to overcome centrifugal force, a specially light cylinder block embracing the intake and exhaust manifolds, and a light construction in the crankcase, the timing chain cover and other car parts by the use of stamping in such places where strength is not a primary consideration. In addition to the balanced crankshaft, designed to prevent appreciable wear on the crankshaft bushings, tubular connecting rods are used, these also being specially balanced at the lower ends by a short extension of the tubular shaft from the connecting rod cap.

The lubrication throughout is by pressure to the main bearings rather than by the rough system earlier in vogue in Knight motors. With the pressure system their is a flow in proportion to motor speed from 15 to 60 pounds pressure, the latter mark representing the high mark of pressure. The high-speed, high-efficiency motor has a three-part electric system including an Eisemann magneto constituting the only ignition system, a Gray and Davis cranking motor and also a Gray and Davis lighting generator.

The chassis possesses not a few improvements in spite of its price. First comes the use of spiral bevels in the rear axle, and also the use of a pressed steel axle housing taking the place of the forging type. The service brake is moved from the rear wheels to back of the gearbox; cantilever rear springs are introduced and the gasoline tank is placed in the cowl.

Besides being manufactured as a touring car it is marketed as a cabriolet and also a limousine.

Stearns is listing two other models, one known as the big four, 4.25 by 5.5 cylinders, and the other the six, 4.25 by 5.75. These are continued practically as during last year.—F. B. Stearns Co., Cleveland, O.

Stevens-Duryea Increases Bore

A 1-16-inch increase in bore in the larger motor, a shift from right to left drive and the fitting of electric starting and lighting as stock equipment are the three changes in Stevens-Duryea cars. While the roadster and touring cars are made under the same model number, they are really two different chasses, as the wheelbase for the roadster is 131 inches and for the touring car is 138 inches, the same as for 1914.

The feature of the new line is the roadster with a 4.325 by 5.5 power plant. Besides the novel adaptation of the streamline effect, a sloping deck has been provided which incloses a compartment for carrying two spare tires mounted on their rims, or one wire wheel mounted and an extra tire. When the top is down it disappears completely inside the body and it is supported by mechanical means by neat rigid joints which cause it always to follow a certain path when folding into and being withdrawn from the body. It is self-supporting and when up requires no braces, being rigidly fastened to the windshield support. When the top is folded, the concealing compartment is completely covered by the upholstery and when up the opening is also covered.

Except for the change in bore, the power plant for the touring cars remains the same. It is 4 7-16 by 5.5 suspended at three points. Like other Stevens cars this has a disk clutch, progressive three-speed gearset, floating axle and 37 by 4.5 tires.

A new type of auxiliary seat is used in the seven-passenger touring cars. Each seat has one upholstered arm on the inner side and the upholstered arm rail provides the rest on that side. The construction allows for folding backward and sidewise against the side of the tonneau, or it can be tipped

forward in front of the entrance allowing plenty of room in the tonneau and concealing the extra seats from view. An addition to the line is made in the form of a seven-passenger landaulet on a 139-inch wheelbase chassis.—Stevens-Duryea Co., Chicopee Falls, Mass.

Studebaker Alters Manifold

The two 1914 Studebaker chassis are continued with the same elemental features of design, but many alterations have been made, with the result that the cars are larger, although selling at \$65 less for the four and \$190 less for the six, making the present prices \$1,385 for the five-passenger car and \$1,450 for the seven-passenger six.

In both motors an increase of 15 per cent. has been made possible in the maximum power by reducing the weights of the reciprocating parts and altering the manifold design. Four ounces have been cut from the piston assembly and although the valve sizes remain the same, greater efficiency has been obtained by increasing the port sizes. The lubrication system has been maintained, but the scoop has been changed in shape and the splash troughs altered to give greater oil economy.

While the Schebler Model R carbureter is used this year, a water jacket and a means of pre-heating the intake gases from the exhaust are also included. In the four the carbureter bolts against the integral cylinder casting without any exterior intake manifold.

The same clutch has been maintained, but the leverage on the operating members on the six is altered to give an easier throw. Instead of the exterior flange connected with the wheel on the rear axle drive shaft there is now a tapered-fitting connection with the driving flange and in place of the flat plate the wheel now carries a hub cap.

By improvements in the body work and equipment much weight has been cut from these models. This has been effected by substituting pressed steel for wood and by the use of a new top. The instrument board is now a stamping and is free from the instruments. Side lamps are discontinued and the bodies are full molded stream effects.—Studebaker Corp., Detroit, Mich.

Stutz Has New Small Four

Two new Stutz cars have appeared for the 1915 season. One is a four-cylinder roadster on a smaller chassis than any yet put out by this concern and the other is a four-passenger speed body mounted on the same chassis as the roadster which has been marketed during the past year. This brings the line to ten cars, six fours and four sixes. Of the four-cylinder models the touring and sedan have a wheelbase of 130 inches and sell respectively at \$2,275 and \$3,675; the Bulldog roadster and Bearcat have a wheelbase of 120 inches and are listed respectively at \$2,250 and \$2,000.

The H. C. S. four, which is a new model and lists at \$1,475, has a wheelbase of only 108 inches. Of the four sixes the touring and sedan, which have a wheelbase of 130 inches, cost respectively \$2,400 and \$3,800, while the roadster and Bearcat, which both have a wheelbase of 120 inches, are listed at \$2,125 each.

The smaller car is a typical Stutz design except that an L-head motor is used, whereas former motors have all been T-heads. Another departure is the casting of the cylinders in blocks instead of pairs. The use of block cylinders and the connection of the forward end of the torque tube to the clutch housing instead of to a cross frame member has rendered possible a wheelbase of 108 inches, whereas the larger roadster has 120 inches.

The new four-passenger speedster is styled the Bulldog. It is mounted on a chassis of 120-inch wheelbase, this being the same chassis in every particular as that manufactured for the 1914 season.

The characteristics of Stutz design which are common to

all the cars are the leather-faced cone clutch and the Stutz rear system with its three-speed gearbox mounted just forward of the differential housing in unit with the axle. Wire wheels are furnished at \$100 additional and a wide range of body colors is optional.—Stutz Motor Car Co., Indianapolis, Ind.

Touraine Has a Six

Two Touraine cars, one a touring and the other a limousine, both of seven-passenger capacity are put out on the 134-inch wheelbase. The six-cylinder power plant has its 4 by 5.5 cylinders cast in threes. They are of T-head shape. The maker's rating of this motor is 61 horsepower at 2,220 r.p.m. The intake valves are located on the right and the exhaust valves on the left. Both camshafts are driven by spiral gears. The lubricating system is a circulating splash operated by a gear pump and the water cooling system has a centrifugal pump which forces the water through a honeycomb radiator.

For ignition a Bosch dual system is provided. The gasoline system is a pressure feed with the gasoline tank swung on the rear. The capacity of the tank is 23 gallons, and is used in connection with a 1.5-inch Zenith carbureter. Starting and lighting is by the Westinghouse 6-volt system with single wiring. The storage battery is a 150-ampere-hour Exide.

The clutch is a multiple disk carried in the flywheel having steel against raybestos friction surfaces. The gearbox provides four speeds and the rear axle is a floating design with the propulsion taken through the torsion tubes. Control is in the center with the steering wheel on the left. Full equipment is sold with the car, the tires being 34 by 4.5 with Q. D. demountable rims.—Touraine Motor Car Co., Philadelphia, Pa.

Trumbull Drops Friction Drive

The most radical change in the Trumbull car is in the transmission. The friction and chain drive has been eliminated, substituting in its place a selective, sliding gearset having three speeds. This is in unit with the differential on the semi-floating rear axle. A cone clutch is also used in connection with center control and the car has been equipped with both internal and external brakes operating on the rear hubs. The motor has been remodeled to some extent, principally in the shortening of the intake manifold which has resulted in the raising of the carbureter. A newly designed camshaft with cams which have been laid out along the line of quietness are also innovations.

The Trumbull is a miniature automobile. It is built along standard lines and has all the up-to-date equipment and luxuries of larger cars except the size. The wheelbase is 80 inches and the tread 44 inches. It is claimed that a fuel consumption of 35 miles per gallon of gasoline can be obtained with this little car. It is made in two styles for passengers, that is, a roadster and a coupé. Electric lighting and starting is extra but all the ordinary equipment is standard.

The four-cylinder motor has its 2.875 by 4 cylinders cast in a single block. It is lubricated by a combination pressure and splash system in which a pump delivers oil to all the main bearings and timing gears and the rest of the motor is lubricated by the splash. The two-passenger body which is regularly fitted is of the sociable roadster-type having the seat continuous without subdivision between the driver and passenger.—Trumbull Motor Car Co., Bridgeport, Conn.

Twombly Has Narrow Tread

Two-passenger bodies, a town car which serves as a taxicab and a roadster of two-passenger capacity are mounted by the Twombly company on their 100-inch wheelbase chassis with 44-inch tread.

The power plant is a four-cylinder 3.125 by 4 with L-head cylinders cast in a single block. The cylinder heads are re-

movable which is unusual in the L-head type of construction. Both intake and exhaust valves are on the left and are driven from a single camshaft through a helical timing gearset. The intake and exhaust manifolds are cast together and are un-jacketed. The motor is supported at three points.

Cooling is effected by a thermo-syphon system, lubrication by circulating splash and ignition by the Splitdorf single high tension system with hand control. The carbureter is optional, being either a Holly or Zephyr 1-inch, fed by gravity from the 8-gallon gasoline tank located in the cowl.

A cone clutch transmits the drive to a three-speed selective gearset located on the rear axle. From this point the transmission consists of a worm beneath the wheel mounted just to the rear of the gearbox and a semi-floating rear axle. The wheels are of wire and are undemountable. The tires are 30 by 3.5 and the rear spring is a compound cantilever. This spring, contrary to general light car practice, does not transmit the drive as this is taken through a torsion tube. Two sets of brakes are fitted, both on the rear wheels. The bodies though small, as is natural with the short wheelbase and narrow tread, are fitted with up-to-date equipment and deep upholstery.—Twombly Motors Co., New York City.

Velie Adds a Six

A new six named the Biltwel model at \$1,595, is the leader of the Velie line. Besides this car two of last season's models, a four and a six, are continued. The six sells for \$2,015 instead of \$2,350 and the four at \$1,750 instead of \$2,000. Better bodies are used on these two cars, but no mechanical changes have been made.

The new six incorporates among its noteworthy features a spiral-bevel rear axle, Hotchkiss drive, Atwater Kent ignition with automatic spark advance and Stewart vacuum feed. The motor, a Continental 3 1-2 by 5, forms a unit power plant with a cone clutch and a four-speed gearset. The chassis frame has an unusual taper, the distance between front spring centers being 27 1-4 inches, allowing a very short turning radius. The equipment includes Gray & Davis cranking and lighting, power tire pump, auxiliary emergency battery for ignition, double headlights, inspection lamp, etc.

The four has a Velie-made motor 4 5-8 by 5 1-4 and two of the features are the transverse drive of the magneto, and the feed from the carbureter through a pipe passing over the cylinders to the other side of the motor. The drive system includes a disk clutch, four-speed gearset and Timken floating axle. The larger six is Continental equipped, the cylinders being 3 3-4 by 5 1-4, and in general design is the same as the new six.—Velie Motor Vehicle Co., Moline, Ill.

Vixen Has Friction Drive

A small 36-inch tread vehicle with a 106-inch wheelbase and fitted with a three-passenger tandem-seating body is being marketed by the Davis Co., under the name of the Vixen. It is fitted with a four-cylinder, block motor, 2 3-4 by 4, using Atwater Kent ignition and thermo-syphon cooling. The drive incorporates a friction set located under the rear seat there being one friction driving wheel for each rear wheel. The disks are fiber against iron and the final propulsion is by side chains to the wheels. The latter are wire 28 by 3.—Davis Mfg. Co., Milwaukee, Wis.

Vulcan a New Block Four

The Vulcan company has brought out a new car for this season. It is fitted with a Buda four-cylinder 3.5 by 5.125 power plant, multiple disk clutch, Fuller three-speed gearbox, three-quarter floating rear axle and is mounted on a wheelbase of 120 inches. This chassis is provided with a five-passenger touring body of streamline design.

The L-head cylinders are cast in a block and are provided with integral water jackets which are so baffled that the water is discharged directly beneath the valves and cir-

culates entirely around these cylinders. The top of the cylinders is provided with a cover which can be removed allowing access to the water jackets. The base flange of the cylinder casting is continued horizontally to form a housing for the valve lifter guides.

The crankshaft is carried on three main bearings and is of open-hearth steel having a tensile strength of 120,000 pounds to the square inch and an elastic limit of 85,000 pounds to the square inch. The bearings are lined with die cast nickel babbitt and the camshaft bearings which are also three in number are lined with phosphor bronze.

A combination splash and pressure system takes care of the oiling. A gear pump takes the oil from the lower half of the crankcase to the tops of the main bearings and the lubricant flows from these to the splash trough.

In the clutch there are eight plates lined with raybestos. These deliver the power to the three-speed gearbox which is mounted on imported ball bearings transmitting the power to a Salisbury three-quarter floating rear axle. The springs are cantilever design 48 inches in length. Steering is by worm and wheel.

The body lines are continuous, following the dictates of streamline fashion, and provide 24.5 inches leg room in the rear and 33 inches leg room in the front. The fenders are crowned and made from 22-gauge fender steel.—Vulcan Mfg. Co., Painesville, O.

Westcott a Four and Six

Two cars, a four and a six, of the same principle specifications throughout except in regard to the number of cylinders and the rear axle, make up the Westcott line. Both motors are L-head blocks with 3.5 by 5-inch cylinders giving S. A. E. horsepower rating of 19.6 and 29.4 for the four and six respectively. The valves of the motors are on the left, both operated by camshafts with the cams cut integrally. The camshafts are driven by helical gears and the valve adjustments are accessible by means of removable cover plates.

Pump water circulation is used for cooling, and oiling is by splash with the lubricant circulated by means of a plunger pump driven off the camshaft. Delco dual ignition starting and lighting is standard equipment on both models. The ignition system is provided with automatic spark advance.

On both models the clutch housings and gearboxes are part of the unit power plant suspended at three points. The power is delivered by cone clutches to three-speed selective gearboxes. The final drive is accomplished by bevel gears. The thrust of propulsion is taken through the springs. The rear axle on the model O which is the four-cylinder car is a three-quarter floating while that on the model U, the six, is a floating design. A difference in final gear reduction will be noted on the two cars. That of the four is 4 to 1 and on the U it is 3.77 to 1. The wheelbases are respectively 113 and 125 inches for the four and six. The smaller car uses 33 by 4 tires and the six 35 by 4.5. Both cars have wood wheels and left drive with center control. The springing differs materially, however, as cantilevers are used on the six and three-quarter elliptics on the four.—Westcott Motor Car Co., Richmond, Ind.

White Makes Six to Order

Listing only two four-cylinder models and building the six to custom order is one example of the practical discontinuance of the six. This is the White policy, the fours being generally improved, fitted with an entire line of new bodies and slightly increased in price. One dominant factor in the new Whites is the lower bodies, the frames now being but 25 inches from the ground yet allowing for a clearance of 10 inches under the apron. In the large four this lowering is accomplished first by underslinging the three-quarter rear spring, second by dropping the frame side members and lastly by dropping the front axle.

The chassis has been altered in many respects notwithstanding the continuation of block type cylinders with integral manifolds, four-speed gearsets and disk clutches. The Entz motor generator, heretofore under the hood, is now located at the right rear of the chassis, approximately under the tonneau floor, and in this new position is driven by a forward shaft and sprocket and silent chain from the flywheel. The new position is more accessible and the drive is not through the timing gears as formerly. A great improvement has been made in the wiring, all of which is brought to a junction box on the front of the dash immediately over the steering column.

Gasoline feed is now by the Stewart vacuum system, which permits the carburetor being carried much higher, being directly bolted to the side of the casting, and also allows of a rear gasoline tank on all models. All motor and lighting controls are mounted on the forward side of the steering column below the wheel, the control box being a cylinder shape placed transversely on the column. A new form of clutch brake is intended to stop spinning in gearshifting; and there is now an equalizer in the service brake as well as in the emergency one. All lights take 21-volt bulbs. The oil reservoir is removed from the side of the motor and placed on the forward side of the dash; Silverton cord tires are stock.

Bodies are new streamline creations with a flaring hood which leads into a heavy cowl with a backward curve directing the eye to the seat line. Back of the front seat is a center cowl, which aids in carrying out the streamline design. The bodies are widest in rear of the front seats. Auxiliary tonneau seats are sunk 2.75 inches into the floor so that the passengers do not sit higher than those on the rear seats. Crowned fenders are used; the windshield is very low and tilts back; upholstery is tufted vertically rather than in diamond pattern; and a one-man top is standard. Compartments in rear of the front seat are fitted in some models.—White Company, Cleveland, O.

Willys-Knight Heavier Axle Housing

The new Willys-Knight, model K-19, is practically the same mechanically as its predecessor, model K-17, but it has a new streamline body and sells for \$275 less, or \$2,475. The body changes are radical, the hood being sloped and a rounded cowl uniting it with the body. The older car had a straight hood, and there was a decided break between bonnet and body. A slight change is found in the floating axle, which has a new design of housing stronger and lighter than the old. The gearbox is somewhat different in design.

The motor, a Knight type with sliding-sleeve valves, has cylinders 4 by 5 1-2 cast in pairs and with removable heads. The engine uses a five-bearing crankshaft, and is a standard Knight design.

Ignition is by a high-tension magneto which is independent of the cranking and lighting system, the latter being of the combination type with the motor-generator in the flywheel. Force feed oiling is used, and cooling is by a centrifugal pump.

The rear axle, with its new and lighter housing, is still a worm drive type, with the worm carried under the worm wheel, and running continually in a bath of oil. The ratio is 4.83 to 1. Drive comes back to it through a cone clutch and open drive shaft with two universals. The four-speed gearset is located in the center of the chassis.

The rear spring suspension is the Lanchester cantilever form, with these springs measuring 52 by 2 1-4 inches. They attach at two points outside the side frame rails and at their rear end to the axle tubes.

Center control with left steering are employed. Tires are 36 by 4 1-2 on demountable rims.

The standard body finish is a dark blue with ivory striping, and a feature of the front seat is the adjustable cushion

to accommodate the driver in reaching the control pedals.—Willys-Overland Co., Elyria, O.

Winton Announces Smaller Six

Winton has entered the lists of those who are making two models, having just announced an additional car known as 21-A which is a smaller six than the model 21. In general design the new car is similar to the larger model but is smaller throughout. While the model 21 has a 4.5 by 5.5 power plant the 21-A dimensions are 3.625 by 5.25. The wheelbases of the two cars are respectively 136 and 128 inches and the tire sizes 37 by 5 and 36 by 4.5.

The only change made in the large car is in the refinement of the bodies and the increased radiator size. The small car is a new job throughout. Like its older brother the power plant has its six cylinders cast in an L-head with the valves on the left. The valve action is inclosed and the crankcase is extended back to include the flywheel. In the former model the flywheel was not inclosed.

The valves are tungsten steel on the exhaust side and carbon steel with nickel steel heads on the intake. The valve springs, plungers and adjustment nuts are covered by steel plates which are detachable by removing hand screws.

The crankshaft is of chrome vanadium steel carried on four plain bearings lined with white brass. All the bearings are carried in the upper half of the crankcase. A point in which the new model differs from the old is in the mounting of the carburetor and other auxiliaries. The carburetor is carried quite high and is bolted by means of a short elbow against the balanced intake manifold. The carburetor and magneto on the new model in connection with the generator and water pump are all on one side of the motor, leaving the left side absolutely clear except for the Bijur cranking motor which is on a bracket in connection with the left rear foot of the crankcase.

Pressure feed lubrication is used and ignition is by the Bosch dual system. The cooling water is circulated by gear-driven centrifugal pump which forces the water through jackets which are lined with an anti-corroding surface. The radiator is a honeycomb and it is bolted to the drop frame. Lighting and starting is by the Bijur two-unit system.

The drive is transmitted through an eleven-disk dry plate clutch, a four-speed gearbox and a driveshaft which has a universal joint at each end. Spiral bevel drive is used and the rear axle is floating. The Winton company offers five gear reductions running from 3 1-16 to 1 to 4 1-12 to 1. All types of body are mounted on the new car.—Winton Motor Car Co., Cleveland, Ohio.

Zimmerman Continues Its Six

The six-cylinder car rated at 55 horsepower which was marketed by the Zimmerman company for the 1914 season will be continued for 1915. The two-cylinder models which were known as D & E and which could be secured last season have now been discontinued in line with the policy of American manufacturers to eliminate the two-cylinder car. Zimmerman last season was among the few that remained for 1914 who continued to market the two-cylinder car. This year there are but .5 per cent. who still continue the two-cylinder policy.

The six-cylinder car is an up-to-date design in every particular. The body work has been improved this season and the side lamps have been eliminated, leaving the running lights contained in the headlamps. The dimensions of the motor are the same as for 1914, being 4 by 5, with L-head cylinders cast in pairs. The chassis is provided with a disk-in-oil clutch and three-speed gearset. Ignition is by the Remy dual system and electric starting is used. For 1914 Zimmerman offered an option of compressed air or electric starting. The car is sold fully equipped and is mounted on a 132-inch wheelbase.—Zimmerman Mfg. Co., Auburn, Ind.

Events Scheduled for Show Week

The Show

Fifteenth Annual National Automobile Show, Grand Central Palace, January 2-9, Beginning at 2 p.m. on Saturday, January 2. Other Days Show Opens at 10 a.m. and Closes at 10.30 p.m. Admission 50 Cents. Except Society Day, Wednesday, January 6, When It Is \$1.

No Commercial Cars Shown—Special Information Bureau for Commercial Vehicle Manufacturers.

Motor Truck Club of America's Offices Will Be Open Evenings for Convenience of Truck Representatives. The Club Will Make Arrangements for the Rental of Additional Office Space at 1790 Broadway, for Use of Visiting Truck Manufacturers and in Conjunction with the Activity of the National Automobile Chamber of Commerce Along Similar Lines.

Exhibitors Will Be Obligated to Get Their Displays in Building and Completely in Place Before 12.30 p.m. of Opening Day. After That Hour No Goods Will Be Admitted.

Social and Business

- Jan. 4—Chalmers Motor Co.—Dealers' Meeting at Healy's, 66th street and Columbus avenue.
- Jan. 4—Motor Dealers' Contest Assn.—Board of Directors' Meeting, 222 West 59th street, 1 p.m.
- Jan. 5—National Automobile Chamber of Commerce—Patents Committee Meeting, 7 East 42nd street, 3 p.m.
- Jan. 5—Studebaker Corp.—Dealers' Meeting, Manhattan Hotel.
- Jan. 5—Society Automobile Engineers—Meeting Standards Committee, Society Headquarters, 1790 Broadway.
- Jan. 5—National Automobile Chamber of Commerce—Banquet at Waldorf-Astoria, 7 p.m.
- Jan. 6—Motor and Accessory Manufacturers, 33 West 42nd street. Executive Committee Meeting, 9.30 a.m. Finance Committee Meeting, 10 a.m. Board of Directors' Meeting, 11 a.m. Twelfth Annual Meeting, Waldorf-Astoria, 3 p.m. Annual Banquet, Waldorf-Astoria, 7.30 p.m.
- Jan. 7—Motor and Accessory Manufacturers—Board of Directors' Meeting at 33 West 42nd street, 2.30 p.m.
- Jan. 6—National Automobile Chamber of Commerce Meeting, 7 East 42nd street, 10 a.m.
- Jan. 6—Cycle Parts and Accessories Assn.—Annual Meeting, Hotel Astor, 10 p.m.
- Jan. 6—Briggs-Detroit Co.—Meeting of Eastern Dealers, Vanderbilt Hotel.
- Jan. 7—Briggs-Detroit Co.—Meeting of District Sales Managers, Vanderbilt Hotel.
- Jan. 7—Franklin Automobile Co.—Dealers' Get-together Dinner, McAlpin Hotel, evening.
- Jan. 7—Chas. E. Riess & Co.—Dinner at Vanderbilt Hotel.
- Jan. 7—Willys-Overland Co.—Banquet at Biltmore Hotel, evening.
- Jan. 7—Paige-Detroit Motor Car Co.—Dealers' Dinner at Riesenweber's, 58th street and 8th avenue, 7 p.m.
- Jan. 7—Saxon Motor Co.—Dealers' Luncheon, Knickerbocker Hotel, 1 p.m.
- Jan. 7—A. J. Picard & Co.—Dealers' Dinner at Cafe Des Beaux Arts; Trip to General Electric Plant, Lynn, Mass., by special train.
- Jan. 9—Chandler Motor Car Co.—Dealers' Dinner at Manhattan Hotel, 11 p.m.
- Jan. 9—American Automobile Assn.—Executive Board Meeting, 437 Fifth avenue, 10 a.m.

S. A. E. Program

Tuesday, January 5, at 1790 Broadway

Standards Committee, 9 a.m.
Governing Committee of the Sections, 8 p.m.
Council Meeting, 8 p.m.

Wednesday, January 6, at Engineering Societies Bldg.

Business Session, 10 a.m.

President's Address.
Treasurer's Report.
Report of Tellers of Election of Officers.
Report of Membership Committee.
New Business.
Report of Ball and Roller Bearings Division—F. G. Hughes, Acting Chairman.
Report of Carburetor Fittings Division—J. J. Aull, Acting Chairman.

Professional Session, 1 p.m.

Automobile Bodies—H. J. Hayes.
Report of Commercial Car Wheels Division—Wm. P. Kennedy, Chairman.
Report of Electric Vehicle Division—A. J. Slade, Chairman.

Continuation of Professional Session, 8 p.m.

Pros and Cons of Correct Tire Inflation—C. B. Whittelsey.
Report of Pleasure Car Wheels Division—Henry Souther, Chairman.
Wire Wheels versus Wood Wheels—R. B. Mudge.
Wire Wheels versus Wood Wheels—Geo. W. Houk.
Report of Lock Washer Division—C. E. Davis, Acting Chairman.
Report of Miscellaneous Division—J. G. Utz, Chairman.

Thursday, January 7, at Engineering Societies Bldg.

10 a.m.

Report of Electrical Equipment Division—A. L. Riker, Chairman.
Railway Gasoline Locomotives—A. B. Ehle.
An Eight-Cylinder Motor—H. G. Chatain.
Report of Research Division—David L. Gallup, Chairman.
Universal Joint Efficiency—C. W. Spicer.

1 p.m.

Malleable Iron Castings—Dr. Richard Moldenke.
Report of Frame Sections Division—J. G. Perrin, Chairman.
Report of Iron and Steel Division—Henry Souther, Chairman.
Nomenclature of Car Parts.
Allowances for Piston Fits—E. W. Weaver.
Worm Gearing by a New Process—C. T. Myers.
Discussion of Time and Place of 1915 Summer Meeting.

8 p.m.

Automobile Engineering Curricula—Prof. W. T. Fishleigh.
Motor Car Testing—A. B. Browne and E. H. Lockwood.
Warning Signals—Alden L. McMurtry.
Report of Springs Division—C. W. McKinley, Chairman.
Cantilever Springs—J. G. Utz.
Report of Standards Exchange Division—K. W. Zimmerschied, Chairman.
The European Situation as Affecting America—A. Ludlow Clayden.

Informal Dinners at Bustanoby's Restaurant, 110 West 39th Street
Wednesday, January 6, 6.30 p.m. Thursday, January 7, 6.30 p.m.

Official Headquarters of Some Automobile and Accessory Makers

| Make | Hotel | Make | Hotel | Company | Headquarters |
|------------------|---------------|------------|----------|----------------------------------|---------------------|
| Allen | Claridge | Studebaker | Biltmore | Globe Machine & Stamping Co. | Astor |
| Apperson | Astor | Stutz | Woodward | Garford Mfg. Co. | Cumberland |
| Cadillac | Astor | Winton | Astor | Gray & Davis | Manhattan |
| Cartecar | Manhattan | Westcott | Biltmore | Hampton Kerosene Carburetor Co. | Office |
| Case | Woodward | | | Hartford Suspension Co. | Office |
| Chalmers | Biltmore | | | Kellogg Mfg. Co. | Biltmore |
| Chandler | Manhattan | | | Kokomo Electric Co. | Martinique |
| Chevrolet | Woodstock | | | Lane Bros. Co. | San Rafael |
| Cole | Biltmore | | | Marvel Auto Supply Co. | McAlpin |
| Crawford | McAlpin | | | Mayo Mfg. Co. | Astor |
| Cunningham | McAlpin | | | Massnick-Phipps Mfg. Co. | Cumberland |
| Detroit | Vanderbilt | | | Max Machine Co. | Belmont |
| Franklin | McAlpin | | | McQuay Norris Mfg. Co. | McAlpin |
| Grant | Astor | | | Mossberg Co., Frank | Manhattan |
| Herff-Brooks | Astor | | | National Screw & Tack Co. | Belmont |
| Hupmobile | Vanderbilt | | | New Era Spring & Specialty Co. | Park Avenue |
| Inter-State | Astor | | | Perkins-Campbell Co. | Manhattan |
| King | Vanderbilt | | | Remy Electric Co. | Waldorf |
| Krit | Biltmore | | | Platt & Washburn Refining Co. | Manhattan |
| Lewis | Manhattan | | | Positive Supply Co. | Knickerbocker |
| Lyons-Knight | Astor | | | Sager Co., J. H. | Park Avenue |
| McFarlan | Wallacks | | | Schwarz Wheel Co. | Knickerbocker |
| National | Vanderbilt | | | Shaler Co., E. U. | Broadway Central |
| Norfolk & Marmon | Vanderbilt | | | Shaler Co., C. A. | McAlpin |
| Oakland | Vanderbilt | | | Silvex Co. | Park Avenue |
| Oldsmobile | Astor | | | Spitler, N. W. | St. Denis |
| Packard | Vanderbilt | | | Standard Woven Fabric Co. | Manhattan |
| Paige-Detroit | Astor | | | Stewart Auto Accessories Co. | Astor |
| Pathfinder | Astor | | | Stewart-Warner Speedometer Corp. | Astor |
| Peerless | Astor | | | Stromberg Motor Devices Co. | Astor |
| Pierce-Arrow | Biltmore | | | Van Sicklen Co. | Biltmore |
| Pilot | Claridge | | | Veeder Mfg. Co. | Belmont and McAlpin |
| Remington | Astor | | | Voorhees Rubber Mfg. Co. | Broadway Central |
| Saxon | Knickerbocker | | | Willard Storage Battery Co. | McAlpin |
| Scripps-Booth | Biltmore | | | White & Bagley Co. | Knickerbocker |

A Directory of Automobile Makers

HEREWITH appears a tabulation of the 1915 lines of 117 automobile manufacturing companies, an analysis of which brings out the concentration of production gradually being adopted. That is, of the 117 companies, fifty-eight are making one chassis only; forty are building two chassis; fifteen have three

chassis; and only two are manufacturing four and five chassis.

There are two eight-cylinder models listed for 1915, one maker dropping all other models and the other continuing a four. There are sixty-eight builders of sixes, thirty-one of whom make this type only. Eighty-four companies are listed

as manufacturing four-cylinder cars, forty-six of them making fours only. Thirty-six concerns are including both four- and six-cylinder chassis in their lines. There is one two-cylinder.

Of the six-cylinder car builders, forty-five have one model only, nineteen have two, three have three chassis and only

| Car Name | Name of Maker | Address | No. Chassis Models | Six-Cylinder | Four-Cylinder | Right Drive | Left Drive | Warm Drive | Wire Wheels | Electric Crankers | Air Crankers | Body Types and Seating Capacity | | | | | | |
|--------------------|----------------------------|-----------------------|--------------------|--------------|---------------|-------------|------------|------------|-------------|-------------------|--------------|---------------------------------|---------|---|---|---|--------|------------------|
| | | | | | | | | | | | | Roadsters, 2&3 | Touring | | | | Coupes | Large Incl. Cars |
| | | | | | | | | | | | | | 4 | 5 | 6 | 7 | | |
| A | | | | | | | | | | | | | | | | | | |
| Abbott-Detroit | Abbott Motor Car Co. | Detroit, Mich. | 3 | 1 | 2 | 2 | 1 | | | 3 | | 1 | | 2 | | 2 | | |
| Allen | Allen Motor Company | Fostoria, Ohio | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Apperson | Apperson Bros. Auto Co. | Kokomo, Ind. | 5 | 4 | 1 | | 5 | | | 5 | | 1 | | 2 | | 2 | | |
| Arbans | Arbans Car Company | Chillicothe, Ohio | 1 | | 1 | 0 | | | | 1 | | 1 | | 1 | | | | |
| Argo | Argo Motor Company | New York, N. Y. | 1 | | 1 | | 1 | | 1 | | | 1 | | | | | | |
| Auburn | Auburn Automobile Co. | Auburn, Ind. | 3 | 2 | 1 | | 3 | | | 3 | | 3 | | 1 | 2 | | | |
| Austin | Austin Automobile Co. | Grand Rapids, Mich. | 1 | 1 | | | 1 | | | 1 | | 1 | | | 1 | | | 3 |
| B | | | | | | | | | | | | | | | | | | |
| Bauer | Bauer Machine Works Co. | Kansas City, Mo. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Briscoe | Briscoe Motor Car Co. | Jackson, Mich. | 1 | | 1 | 0 | | | 0 | 1 | | 1 | | 1 | | | 1 | |
| Buick | Buick Motor Company | Flint, Mich. | 3 | 1 | 2 | | 3 | | | 3 | | 3 | | 2 | | 1 | | |
| C | | | | | | | | | | | | | | | | | | |
| Cadillac | Cadillac Motor Car Co. | Detroit, Mich. | 1 | | * | | 1 | | | 1 | | 1 | | 1 | | 1 | 1 | 4 |
| Cartecar | Cartecar Company | Pontiac, Mich. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Case | J. I. Case T. M. Co. | Racine, Wis. | 3 | | 3 | 1 | 2 | | | 3 | | 1 | | 3 | | 1 | | |
| Chadwick | Chadwick Eng. Works | Pottstown, Pa. | 2 | | 2 | | 2 | | | 2 | | 1 | | 2 | | 2 | 1 | |
| Chalmers | Chalmers Motor Company | Detroit, Mich. | 2 | | 2 | | 2 | | | 2 | | 1 | | 2 | | 2 | 1 | |
| Chandler | Chandler Motor Company | Cleveland, Ohio | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Chevrolet | Chevrolet Motor Company | Flint, Mich. | 2 | | 2 | | 2 | | | 2 | | 1 | | 1 | | | | |
| Cole | Cole Motor Car Company | Indianapolis, Ind. | 2 | | 2 | | 2 | | | 2 | | 1 | | 1 | | | | |
| Corbitt | Corbitt Automobile Co. | Henderson, N. C. | 3 | 2 | 1 | | 3 | | | 3 | | 2 | | 1 | | 2 | 3 | |
| Crawford | Crawford Automobile Co. | Hagerstown, Md. | 1 | | 1 | 1 | | | | 1 | | 1 | | 1 | | | | |
| Crow-Elkhart | Crow Motor Car Company | Elkhart, Ind. | 3 | 1 | 2 | 3 | 1 | | | 3 | | 3 | | 2 | 3 | 2 | | |
| Cunningham | Jas. Cunningham Son & Co. | Rochester, N. Y. | 1 | | 1 | | 1 | | | 1 | | 1 | | | | 1 | | |
| Cycleplane | Cycleplane | Westerly, R. I. | 2 | ** | 1 | *** | 1 | | 2 | 1 | | 3 | | | | 1 | | 2 |
| D | | | | | | | | | | | | | | | | | | |
| Davis | Geo. W. Davis Carriage Co. | Richmond, Ind. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | 2 | | 1 | | |
| Detroit | Briggs-Detroit Co. | Detroit, Mich. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Dile | Dile Motor Car Co. | Reading, Pa. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Dodge | Dodge Brothers | Detroit, Mich. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Dorris | Dorris Motor Car Co. | St. Louis, Mo. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | 1 | | 2 |
| E | | | | | | | | | | | | | | | | | | |
| Empire | Empire Automobile Co. | Indianapolis, Ind. | 1 | | 1 | 1 | | | | 1 | | 2 | | 2 | | | | |
| Enger | Enger Motor Car Co. | Cincinnati, Ohio | 1 | 1 | | | 1 | | | 1 | | 1 | | | | 1 | | |
| F | | | | | | | | | | | | | | | | | | |
| Fiat | Fiat Automobile Co. | Poughkeepsie, N. Y. | 2 | 1 | 1 | 2 | | | 0 | 2 | | 4 | | 2 | | 2 | | 6 |
| Firestone-Columbus | New Columbus Buggy Co. | Columbus, Ohio | 2 | | 1 | | 2 | | | 2 | | 1 | | 2 | | 1 | | |
| Ford | Ford Motor Company | Detroit, Mich. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | 1 | 2 |
| Franklin | H. H. Franklin Mfg. Co. | Syracuse, N. Y. | 1 | 1 | | | 1 | | | 1 | | 1 | | 1 | | | 1 | 2 |
| F. R. P. | F. R. P. Motor Company | Port Jefferson, L. I. | 1 | | 1 | 1 | | | 1 | 1 | | 1 | | 1 | | | 1 | 2 |
| G | | | | | | | | | | | | | | | | | | |
| Glide | Bartholomew Company | Peoria, Ill. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Grant | Grant Motor Company | Detroit, Mich. | 2 | 1 | 1 | | 2 | | 1 | 2 | | 2 | | 1 | | | | |
| Great Western | Great Western Auto Co. | Peru, Ind. | 2 | | 2 | 1 | 1 | | | 2 | | 2 | | 1 | 1 | | 1 | 2 |
| H | | | | | | | | | | | | | | | | | | |
| Haynes | Haynes Automobile Co. | Kokomo, Ind. | 3 | 2 | 1 | | 3 | | | 3 | | 1 | 1 | 3 | | | 2 | |
| Herff-Brooks | Herff-Brooks Company | Indianapolis, Ind. | 2 | 1 | 1 | | 2 | | | 2 | | 2 | | 2 | | | | |
| Herreshoff | Herreshoff Light Car Co. | Troy, N. Y. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| Hudson | Hudson Motor Car Co. | Detroit, Mich. | 2 | 2 | | | 2 | | | 2 | | 1 | | 1 | | | 1 | 7 |
| Hupmobile | Hupp Motor Car Co. | Detroit, Mich. | 2 | | 2 | 1 | 1 | | | 2 | | 2 | | 2 | | | | |
| I | | | | | | | | | | | | | | | | | | |
| Imperial | Imperial Automobile Co. | Jackson, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | | | 1 | | 1 | | |
| Inter-State | Inter-State Auto. Co. | Muncie, Ind. | 1 | | 1 | | 1 | | | 1 | | | | 1 | | | | |
| J | | | | | | | | | | | | | | | | | | |
| Jackson | Jackson Automobile Co. | Jackson, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | 2 | | | | |
| Jeffery | Thos. B. Jeffery Co. | Kenosha, Wis. | 3 | 2 | 1 | | 3 | 1 | | 3 | | 2 | | 2 | | 1 | | 4 |
| K | | | | | | | | | | | | | | | | | | |
| Kearns | Kearns Motor Truck Co. | Beavertown, Pa. | 1 | | 1 | 0 | | | | 1 | | 2 | | | | | | |
| King | King Motor Car Co. | Detroit, Mich. | 2 | * | 1 | | 2 | | | 2 | | 1 | | 2 | | | | 1 |
| Kissel | Kissel Motor Co. | Milwaukee, Wis. | 4 | 3 | 1 | | 4 | | | 4 | | 3 | | 5 | | 3 | | 5 |
| Kline | Kline Motor Car Corp. | Richmond, Va. | 2 | 2 | | | 2 | | | 2 | | 1 | 1 | 1 | | 1 | | |
| Krit | Krit Motor Car Co. | Detroit, Mich. | 2 | | 2 | | 2 | | | 2 | | 2 | | 2 | | | | 1 |
| L | | | | | | | | | | | | | | | | | | |
| Lambert | Buckeye Mfg. Co. | Anderson, Ind. | 2 | | 2 | 1 | 1 | | | 2 | | 1 | | 2 | | | | |
| Lenox | Lenox Motor Company | Boston, Mass. | 2 | 1 | 1 | | 2 | | 0 | 2 | | | | 2 | | | | |
| Lewis | L. P. C. Motor Co. | Racine, Wis. | 1 | 1 | 1 | | 1 | | | 1 | | 1 | | 1 | | 1 | | |
| Lexington | Lexington-Howard Co. | Connerville, Ind. | 2 | 2 | | | 2 | | | 2 | | 2 | | 1 | 1 | 1 | | 2 |
| Locomobile | Locomobile Co. of Amer. | Bridgeport, Conn. | 2 | 2 | | | 2 | | 0 | 2 | | 2 | | 1 | 1 | 1 | | 6 |
| Luverne | Luverne Automobile Co. | Luverne, Minn. | 1 | 1 | | | 1 | | | 1 | | | | | | 1 | | |

* 1 Eight-cylinder chassis. ** 1 Two-cylinder chassis. *** 1 Center drive. O—Optional.

one has four. Among the four-cylinder makers, sixty-eight have but one chassis model, fourteen have two and two companies have three.

Eighteen concerns still make right-drive models, four of them having two models with this type of steering, while two have three chassis and one five. The remaining eleven have one chassis each with right drive. Left drive, on the other hand, is used by ninety-eight makers. Four concerns build cars with

each type of drive. There is one car with center drive and with eight companies right or left drive is optional.

Three firms use worm drive and four-teen fit wire wheels, which are optional with seven. Electric cranks are used by 106, air by two, mechanical by one; with two the system is optional, and two have none.

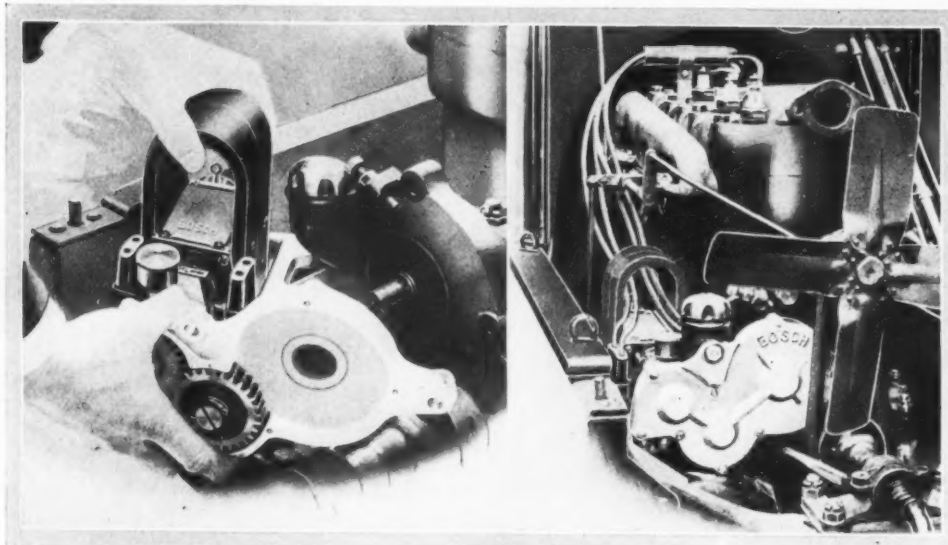
As regards bodies, there are ninety-two companies including two-passenger roadsters in their lines, twenty having

two models of this type, nine having three and one each four and five. Fifteen of the companies make four-passenger touring cars, five having two models, one three and the rest but one. Eighty-five build five-passenger types, twenty-six making two models, seven listing three, one five and the other fifty-one making but one. Twenty firms include six passenger bodies. Seventeen are building coupés and thirty-nine are listing large inclosed models.

| Car Name | Name of Maker | Address | No. Chassis Models | Six-Cylinder | Four Cylinder | Right Drive | Left Drive | Worm Drive | Wire Wheels | Electric Crankers | Air Crankers | Body Types and Seating Capacity | | | | | | |
|-----------------|-------------------------------|-----------------------|--------------------|--------------|---------------|-------------|------------|------------|-------------|-------------------|--------------|---------------------------------|---------|---|---|---|--------|------------------|
| | | | | | | | | | | | | Roadsters, 2&3 | Touring | | | | Coupes | Large Incl. Cars |
| | | | | | | | | | | | | | 4 | 5 | 6 | 7 | | |
| Lyons-Knight | Lyons-Atlas Company | Indianapolis, Ind. | 1 | | 1 | | 1 | 1 | | 1 | | | | 1 | | 1 | | 2 |
| M | | | | | | | | | | | | | | | | | | |
| Maxwell | Maxwell Motor Co. | Detroit, Mich. | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | |
| McFarlan | McFarlan Motor Co. | Connorsville, Ind. | 2 | 2 | | | 2 | | | 2 | 2 | 2 | | 2 | | 2 | | |
| McIntyre | W. H. McIntyre Co. | Auburn, Ind. | 2 | 1 | 1 | 1 | 1 | | | 2 | | 2 | | 2 | | | | |
| Meteor | Meteor Motor Car Co. | Shelbyville, Ind. | 2 | 1 | 1 | | 2 | | | 2 | | | | 2 | | | | |
| Metz | The Metz Company | Waltham, Mass. | 1 | | 1 | | 1 | | | 1 | | 1 | | | | | | |
| Mitchell-Lewis | Mitchell-Lewis M. C. Co. | Racine, Wis. | 4 | 3 | 1 | | 4 | | | 4 | | 3 | | 3 | | 3 | 1 | |
| Moline-Knight | Moline Automobile Co. | East Moline, Ill. | 1 | | 1 | | 1 | | 0 | 1 | | 1 | | 1 | | 1 | | 2 |
| Marmen | Nordyke & Marmon Co. | Indianapolis, Ind. | 2 | 2 | | | 2 | | | 2 | | 1 | | 1 | | 1 | 2 | 3 |
| Monarch | Monarch Motor Car Co. | Detroit, Mich. | 1 | 1 | | | 1 | | | 1 | | 1 | | 1 | | 1 | | |
| Moon | Moon Motor Car Co. | St. Louis, Mo. | 2 | 1 | 1 | | 2 | | | 2 | | 2 | | 1 | | 1 | | |
| Morse | Morse Motor Car Co. | Brookline, Mass. | 1 | | 1 | 1 | | | | 1 | | 1 | | 1 | | 1 | | |
| N | | | | | | | | | | | | | | | | | | |
| National | National Motor Veh. Co. | Indianapolis, Ind. | 1 | 1 | | | 1 | | | 1 | | 1 | | 1 | | | 1 | 3 |
| Norwalk | Norwalk Motor Car Co. | Martinsburg, W. Va. | 1 | 1 | | | 1 | | | 1 | | 1 | | 1 | | 1 | | |
| O | | | | | | | | | | | | | | | | | | |
| Oakland | Oakland Motor Car Co. | Pontiac, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | | | 1 | | |
| Oldsmobile | Olds Motor Works | Lansing, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | | 1 | | 1 | |
| Overland | Willys-Overland Co. | Toledo, Ohio | 3 | 1 | 2 | | 3 | | | 3 | | 2 | | 2 | | 1 | 1 | |
| Owen | R. M. Owen & Co. | Toledo, Ohio | 1 | 1 | | | 1 | | 0 | 1 | | 1 | | | | 1 | | |
| P | | | | | | | | | | | | | | | | | | |
| Packard | Packard Motor Car Co. | Detroit, Mich. | 2 | 2 | | | 2 | | | 2 | | 2 | | | | | | |
| Paige-Detroit | Paige-Detroit M. C. Co. | Detroit, Mich. | 1 | 1 | | | 1 | | | 1 | | 1 | | | | 2 | 1 | 14 |
| Partin-Palmer | Partin Mfg. Company | Chicago, Ill. | 2 | | 2 | | 2 | | | 2 | | 2 | | | | | | |
| Paterson | W. A. Paterson Co. | Flint, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | | 1 | | | |
| Pathfinder | Motor Car Mfg. Co. | Indianapolis, Ind. | 1 | 1 | | | 1 | | | 1 | | 1 | | | 2 | | | |
| Peerless | Peerless Motor Car Co. | Cleveland, Ohio | 3 | 2 | 1 | 0 | 2 | | | 3 | | 3 | | 1 | | 2 | 1 | |
| Peter Pan | Randall Company | Norfolk Downs, Mass. | 1 | | 1 | | 1 | | | 3 | | 3 | | 1 | | 2 | | 10 |
| Pierce-Arrow | Pierce-Arrow Motor Car Co. | Buffalo, N. Y. | 3 | 3 | | 3 | 1 | | | M | | 3 | | 1 | 1 | | 2 | 3 |
| Pilot | Pilot Motor Car Co. | Richmond, Ind. | 2 | 2 | | | 2 | | | 3 | | 3 | | 3 | 3 | | 2 | 4 |
| Pratt | Elkhart Car. & Harn. Mfg. Co. | Elkhart, Ind. | 2 | 1 | 1 | 0 | 1 | | | 2 | | 2 | | 2 | | 2 | | 1 |
| Premier-Weidely | Premier Motor Mfg. Co. | Indianapolis, Ind. | 1 | 1 | | | 1 | | | 1 | | 1 | | 2 | | 1 | | |
| Pullman | Pullman Motor Car Co. | York, Pa. | 2 | 1 | 1 | | 2 | | 1 | 2 | | 2 | | 2 | | 2 | | 3 |
| R | | | | | | | | | | | | | | | | | | |
| Rayfield | Rayfield Motor Co. | Chrisman, Ill. | 1 | | 1 | | 1 | | 1 | N | | 1 | | | | | | |
| R-C-H | R-C-H Corporation | Detroit, Mich. | 1 | | 1 | 0 | | | | 1 | | 1 | | | 1 | | | |
| Regal | Regal Motor Car Co. | Detroit, Mich. | 1 | | 1 | 0 | | | | 1 | | 1 | | | 1 | | | |
| Remington | Remington Motor Co. | New York, N. Y. | 1 | | 1 | | 1 | | | 1 | | 1 | | | 1 | | | |
| Reo | Reo Motor Car Co. | Lansing, Mich. | 3 | 1 | 2 | | 3 | | | 3 | 1 | 1 | | | 1 | | | |
| Republic | Republic Motor Car Co. | Hamilton, Ohio | 1 | 1 | | | 1 | | | 1 | | 1 | | | 1 | | 1 | |
| S | | | | | | | | | | | | | | | | | | |
| Saxon | Saxon Motor Company | Detroit, Mich. | 2 | 1 | 1 | | 2 | | 1 | | | 1 | | 1 | | | | |
| Scripps-Booth | Scripps-Booth Company | Detroit, Mich. | 1 | | 1 | | 1 | | 1 | 1 | | 1 | | 1 | | | 1 | |
| S. G. V. | S. G. V. Company | Reading, Pa. | 1 | | 1 | | 1 | | | 1 | | 1 | | | 1 | | | |
| Simplex | Simplex Automobile Co. | New Brunswick, N. J. | 2 | | 2 | 2 | | | | 2 | | 2 | | | | | | 5 |
| Singer | Singer Motor Company | Long Island City | 1 | 1 | | | 1 | | 0 | 1 | | 1 | | 1 | | | | |
| Spaulding | Spaulding Mfg. Company | Grinnell, Iowa | 1 | | 1 | | 1 | | | 1 | | 1 | | | 1 | | | |
| Speedwell | Speedwell Motor Car Co. | Dayton, Ohio | 1 | 1 | | | 1 | | | 1 | | 1 | | | | 1 | | 1 |
| Sphinx | Sphinx Motor Company | York, Pa. | 1 | | 1 | | 1 | | | 1 | | 1 | | | 1 | | | |
| Stearns | F. B. Stearns Company | Cleveland, Ohio | 3 | 1 | 2 | | 3 | | | 3 | | 3 | | 2 | 2 | 3 | 2 | 6 |
| Stevens-Duryea | Stevens-Duryea Company | Chicopee Falls, Mass. | 2 | 2 | | | 2 | | | 2 | | 2 | | 1 | 1 | | 1 | 7 |
| Studebaker | Studebaker Corporation | Detroit, Mich. | 2 | 1 | 1 | | 2 | | | 2 | | 1 | | 2 | | 1 | | |
| Stutz | Stutz Motor Car Co. | Indianapolis, Ind. | 5 | 2 | 3 | 5 | | | | 5 | | 5 | | | 2 | | | 3 |
| T | | | | | | | | | | | | | | | | | | |
| Touraine | Touraine Company | Philadelphia, Pa. | 2 | 2 | | | 2 | | | 2 | | 1 | | 1 | | 1 | 1 | 1 |
| Trumbull | American Cyclecar Co. | Bridgeport, Conn. | 1 | | 1 | 0 | | | 1 | 1 | | 1 | | 1 | | | 1 | |
| Twombly | Twombly Car Corp. | New York, N. Y. | 1 | | 1 | | 1 | 1 | 1 | 0 | 0 | 1 | | | | | | 1 |
| V | | | | | | | | | | | | | | | | | | |
| Velie | Velie Motor Vehicle Co. | Moline, Ill. | 3 | 2 | 1 | | 3 | | | 3 | | 1 | | 1 | 3 | 1 | | 4 |
| Vixen | Davis Mfg. Company | Milwaukee, Wis. | 1 | | 1 | | 1 | | | N | | 1 | | | | | | |
| Vulcan | Vulcan Mfg. Company | Painesville, Ohio | 1 | | 1 | 1 | | | 1 | 1 | | 1 | | | 1 | | | |
| W | | | | | | | | | | | | | | | | | | |
| Westcott | Westcott Motor Car Co. | Richmond, Ind. | 2 | 1 | 1 | | 2 | | | 2 | | 2 | | 1 | 1 | | | 1 |
| White | White Company | Cleveland, Ohio | 3 | 1 | 2 | | 3 | | | 3 | | 3 | | 1 | | 3 | | 4 |
| Willys-Knight | Garford Company | Elyria, Ohio | 1 | | 1 | | 1 | | 1 | 1 | | 1 | | 1 | | | | |
| Winton | Winton Motor Car Co. | Cleveland, O. | 1 | 1 | | | 1 | | | 0 | | 1 | | 1 | 1 | 1 | | 5 |
| Z | | | | | | | | | | | | | | | | | | |
| Zimmerman | Zimmerman Mfg. Co. | Auburn, Ind. | 1 | 1 | | | | | | | | | | | | 1 | | |

M—Mechanical. N—None. O—Optional.

Gear-Driven Bosch Magneto for Ford



Left—Bosch outfit in process of installation on Ford. Right—Bosch outfit in place

A NEW magneto attachment for Ford cars has been brought out by the Bosch Magneto Co., 223 West Forty-sixth street, New York City. It is gear driven, is placed on the right side, incorporates an NU4 magneto, and the price is \$48 in contrast with the older Ford ignition system in which chain drive is used, the magneto is situated on the left side, the instrument is a DU4 and the price is \$58. The development of the new outfit was in response to a demand for a gear-driven instrument which might be placed on the right side of the motor.

The magneto which is supplied with the attachment was

located on the double slip ring mounted on the armature.

Bearing against the double slip ring are two pairs of brushes, each brush being connected to a spark plug wire. As the armature shaft rotates the segments form a contact in turn with each of the four brushes sending the spark to each plug in turn.

In making the installation the first procedure is to drain the cooling system and remove the radiator. Then the timer case is discarded. The driving gear is attached to the crankshaft and the new timing gearcase which carries the magneto is put in place.

**NU4 Magneto Used—
Placed on
Right
—Price Lower**

described in the September 24, 1914, issue of THE AUTOMOBILE and is the same as that fitted to the new model 80 Overland cars. It differs from the usual Bosch high-tension machine, in that it has no distributor, properly speaking, the high and low-tension windings being entirely insulated from each other. The breaker box mechanism is similar to other Bosch machines, however. The two ends of the secondary winding are connected to the two metal segments

Worm Drive on New Locomobile 3 and 4-Tonners

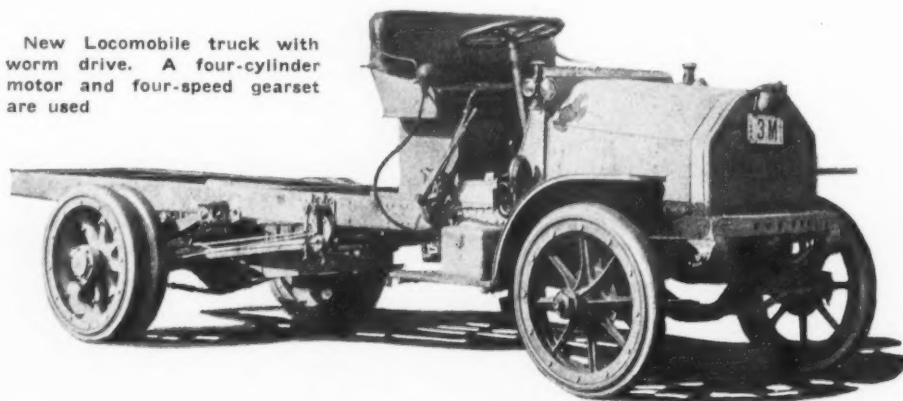
BRIDGEPORT, CONN., Dec. 29—The Locomobile Co., of this city, has added to its line of chain-driven trucks two new models, a 3-ton and a 4-ton, both worm-driven types, these models marking the entry of this company into the worm drive field. Both models are practically alike in every respect excepting that in the 4-ton heavier rear tires and heavier rear springs are used. The designs have been on the road undergoing tests for practically 2 years and at the present time the company is working full capacity on a production of 1,200 for next year. The first lot of 500 is at present going through the factory, and by March 1 it is estimated that production will be thirty to thirty-five vehicles a week.

Both of these new worm-driven types differ from the previous 5 and 6-ton chain-driven types in that the worm drive models have the motor under a hood with the driver's seat in rear, as compared with the motor being located under the seat in the larger chain-driven types. Throughout the new models the same grade of material is used as employed in the Locomobile passenger cars, nickel and chrome nickel steel finding places in many parts of the trucks, including alloy steel springs.

Both models use a four-cylinder motor 4 1-4 by 6, and drive through a four-speed gearset with 1 1-4 inch gears.

The new axle design has a housing made up of steel casting housing the differential and worm and worm wheel. The worm is mounted above the wheel and is a quadruple, straight-thread type. On each model, two reductions are given, one 8 3-4 to 1, the other 10 to 1, and the engine governor is set so that using the 8 3-4 to 1 ratio the truck speed is 14 miles. There are two wheelbase lengths, 150 and 186 inches. On the 3-ton tires are 36 by 5 with rear duals. On the 4-ton fronts are 36 by 5 and the rears 36 by 6 duals.

New Locomobile truck with worm drive. A four-cylinder motor and four-speed gearset are used



Friction Disks in New Hartford Absorber

Frictional Resistance Proportional to the Severity of the Shock—Adjustable to Different Cars

THE distinguishing feature of the new shock absorber that has just been put on the market by the Hartford Suspension Co., Jersey City, N. J., is that it automatically proportions its own frictional resistance to the severity of the road shocks. In one respect it resembles a multiple-disk clutch in that the friction element consists of five steel disks and six brass disks, alternately placed, the whole being held under spring compression in a housing which carries the two arms which connect with the frame and axle of the car. One of these arms is fastened to the brass disks and the other to the steel ones.

The progressive action, which is the feature of the new device, is obtained by so designing the device that a small movement causes only two brass disks and a steel disk in between to offer frictional resistance. A further movement brings in two more disks, and so on until the maximum movement brings all disks into play.

Referring to the accompanying illustration showing the shock absorber disassembled, it will be noted that the brass disks are bolted to the cover plates and the arm A.

The steel disks have internal lugs which engage corresponding flutes on the body of the center hub, the latter being rigidly attached to the arm, which is fastened to the car spring or axle, as the case may be.

However, the flutes on these disks are not all the same size, and this is how the progressive movement is obtained. There is only one steel disk that fits tight on the center hub. On the second steel disk the flutes are further apart and there is considerable play between the disk and the hub; on the next steel disk there is still more play, and so on, the fifth disk having the most play.

When the springs of the car are compressed only slightly, due to a minor road shock, the two arms of the shock absorber are brought closer together and this causes a partial revolution of the first steel disk between the brass ones on each side of it—the other steel disks are not brought into action because of the lost motion in the flutes. The friction due to the rotation of this steel disk between the two brass

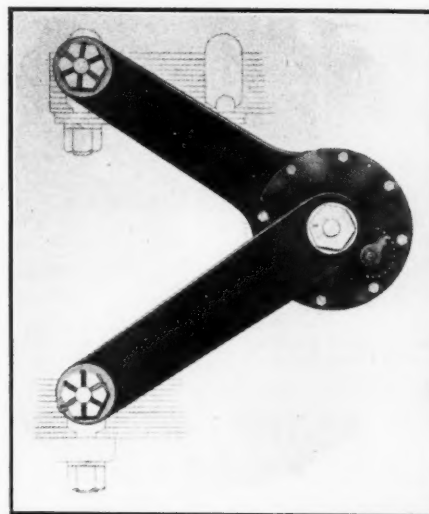
ones opposes the spring movement, absorbing the shock and preventing a quick rebound.

Under a heavier road shock, the first steel disk rotates between the brass ones on each side, but soon the movement is sufficient to take up the lost motion in the second steel disk and it rotates with the first one, thus there are now two steel

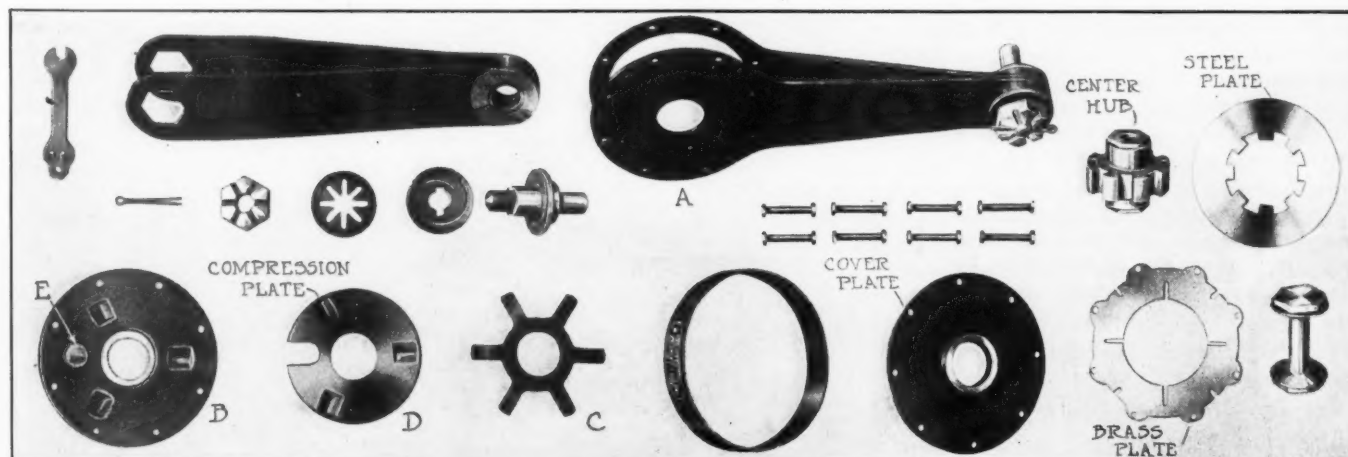
disks and three brass ones in action. A shock which is still more severe will take up the lost motion in the third steel disk and then there will be three steel disks and four brass ones opposing their frictional resistance to the movement of the spring. Fourth and fifth disks operate similarly.

Progressively then with the increasing spring movements due to increasingly severe shocks the impact is taken up, first in three disks, then in five, then in seven, then in nine and finally in the full set, the frictional resistance automatically increasing with the magnitude of the spring movement as the varying clearances of the lugs on the steel disks are taken up by the flutes in the center hub. Progressively in the same way the rebound of the spring is opposed.

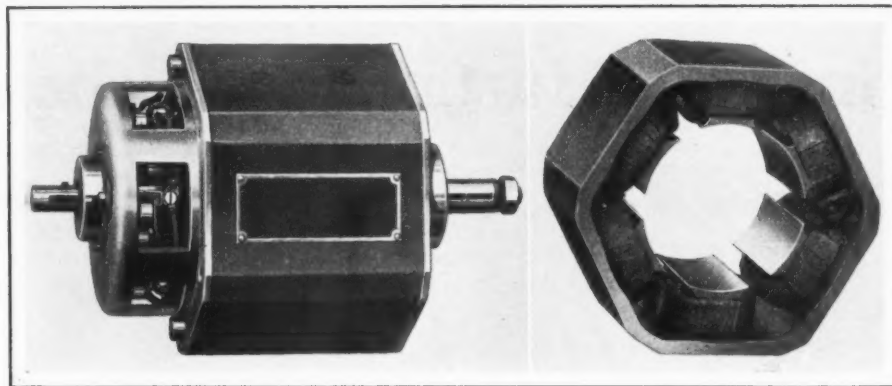
The frictional resistance between the disks may be adjusted to the peculiarities of the car or to meet the owner's preference. Between the cover plate B and the spring spider C is the compression plate D bearing on its exterior, three wedge-shaped elevations. On the interior of the cover plate B are three corresponding wedge-shaped depressions. The eccentric button E on the interior of B engages the slot seen in D. The adjusting wrench F fits over the indicator arm mounted on the stem of the eccentric E. By turning the eccentric the compression plate D is forced inward, thus compressing the spring and increasing the friction.



New Hartford shock absorber mounted on car



Hartford shock absorber showing different parts used in its makeup. Six brass disks are bolted to one arm and five steel ones are keyed to a hub attached to the other arm



Left—Complete machine. Right—End covers removed showing six poles

Simms-Huff Motor-Generator

Has Double Drive—Positive Connection for Starting and Belt for Lighting

A MOTOR-GENERATOR, known as the Simms-Huff, has been added to the line of the Simms Magneto Co., East Orange, N. J. The feature of the device is the use of a belt drive when the machine is operating as a generator, the slippage of the belt being used to adjust the output to the desired amount at any given speed. Voltage regulation is inherent and is obtained by opposing the series and shunt fields. Starter drive is optional. It may be through the flywheel or by chain to the crankshaft or through the timing gears. In any case an over-running clutch must be used. As a starting motor the device operates at 12 volts and as a generator at 6 volts. By the use of a 12-volt starting current the lock torque is stated to be 24 pounds although the complete instrument weighs but 30 pounds.

The features of the instrument include light weight, hexagonal shape to facilitate mounting, an unusual method of disposing of the armature windings and a unique type of brush holder which eliminates all but one wire. The unit is exceptionally compact yet accessibility has in no wise been sacrificed. All the mechanism that requires inspection: brushes, brush holders and commutator, may be exposed by the removal of a single metal casing which slips over the end.

In starting, all the cells in the battery are in series to give the required 12 volts but when the engine is running, the unit automatically becomes a generator and delivers 10 to 15 amperes to the battery at 6 volts pressure.

Series and Shunt Fields

As previously noted, there are two windings, a series and a shunt, which add their magnetic strength when the machine is operating as a motor, but when the device operates as a generator the

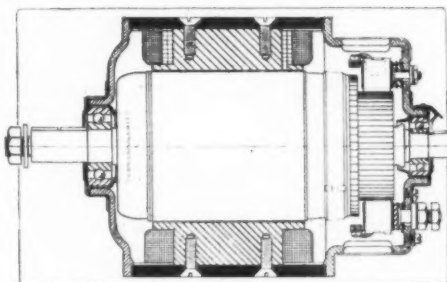
net field strength is the difference of the two fields and in this way the field strength is kept from rising with the speed, with the result that the voltage is maintained nearly constant. A charging rate of from 8 to 15 amperes at from 12 to 18 miles per hour may be obtained by simply varying the belt tension and allowing the armature to slip. If the ammeter registers less than 8 amperes at 12 miles per hour for instance it indicates that the belt should be tightened, a means for this process being provided in a slotted segment and set bolt on the fan support. It is pointed out that by this method of regulation the charging rate can be altered at will to correspond to changes in temperature and lighting load.

The starting switch is arranged to automatically make the necessary series connections at the battery for the starter and parallel connection for lighting. In addition there are two terminals which may be used for a battery circuit in the event of dual ignition being used.

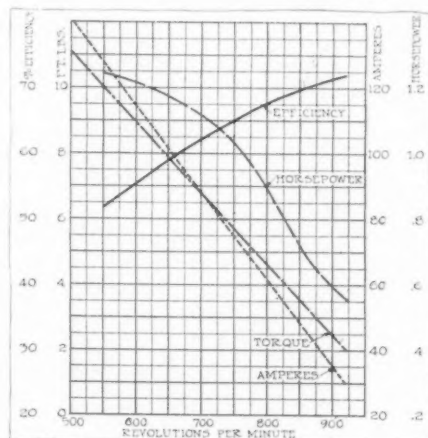
The cutout, which may be mounted on the dash, is of the usual reverse current relay type. It automatically connects the generator and battery when the charging current builds up to the proper strength. The brush holding mechanism is unusual in that all the wires with the exception of one have been eliminated by connecting each set of three brushes to a metallic ring, one of which is a permanent ground and the other, which is a single wire connection, going to the field winding. Thus six wires are done away with.

Holes Instead of Slots

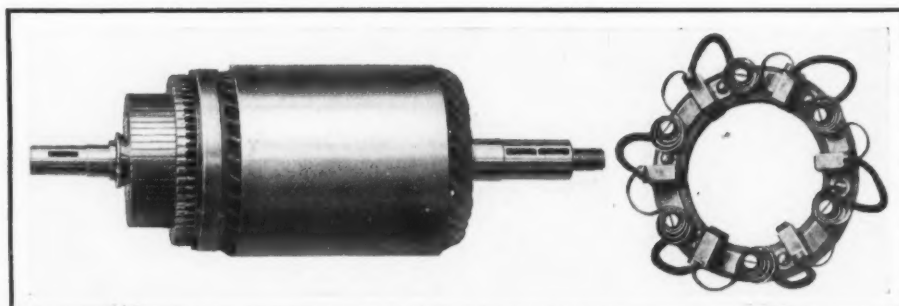
The winding of the armature is another feature that is different from usual practice. Though it is of the drum wound type, the winding is passed through circular holes punched in the core laminations. The result is that the wires are thoroughly protected and cannot be thrown out by centrifugal force should the starting gear stick and cause the armature to rotate at excessive speed and additional surface is exposed to the action of the field. The system, which is at present used only by the Maxwell company, may be readily adapted to almost any other car.



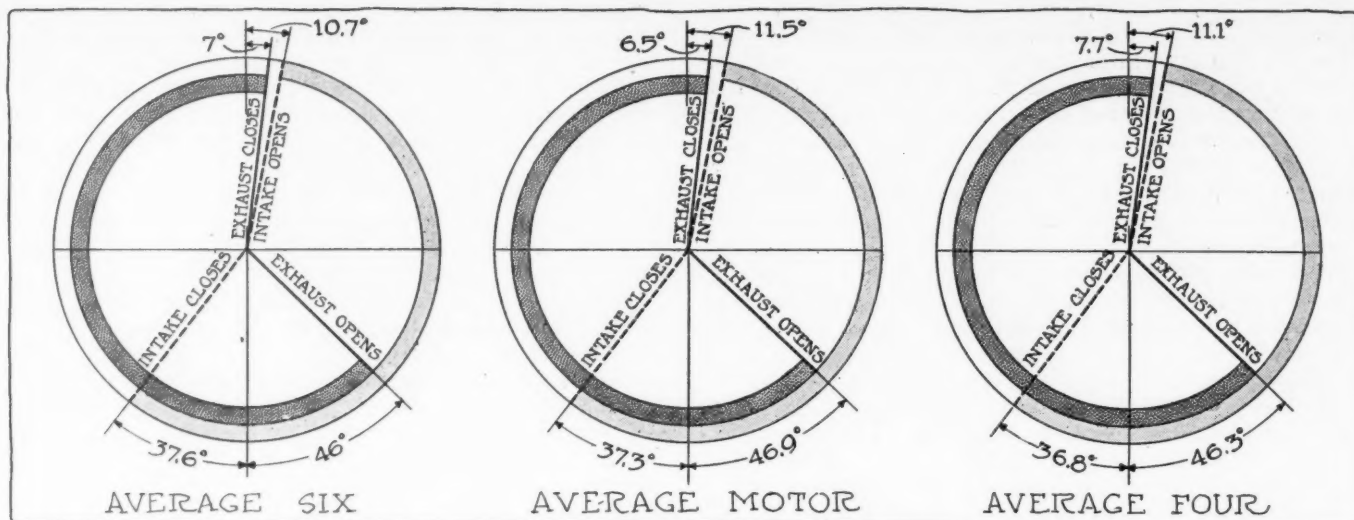
Pole and commutator construction



Performance curve showing efficiency, horsepower, torque and amperes plotted against revolutions per minute when the machine is operating as a motor



Left—Armature showing how windings are passed through holes in the core instead of slots, thus giving a smooth exterior to the armature. Right—Simple brush construction



Left—Diagram of valve timing on the average six-cylinder motor. Center—Timing on the average motor, taking into consideration two-, four-, six- and eight-cylinder types. Right—Timing on the average four cylinder

Negative Lap Gains in Valve Timing

The Average Intake Remains Open Through 205.8 Degrees, While the Exhaust Is Open Through 233.4

VALVE timing has not undergone any radical revision since the models for 1914 were announced. Taking all the motors on the market and striking a general average of the timing the inlet valve would open at 11.5 degrees upper dead center and would close at 37.3 degrees past lower center. The exhaust valve would open at 46.9 degrees before lower center and would close at 6.5 degrees past upper center.

This average timing does not differ materially from the average timing for the 1914 motors when the intake opened at 11.2 degrees past upper center and closed at 35 degrees past lower center, and the exhaust valve opened at 50 degrees before lower center and closed at 9.3 degrees past upper center. A study of these two timings reveals that the intake on the 1915 motor opens at practically the same time as on the 1914 motor. There is a difference of .3 degree which, when considered in piston travel is so small as to be negligible. The inlet closes 2.3 degrees later. This is also a small difference and probably could not be detected on a testing dynamometer.

Exhaust Opens 3.1 Degrees Earlier

In exhaust valve timing practice the time of opening on the average motor is 3.1 degrees later on the 1915 motor than on the 1914. This is more significant as with the increase in the high-speed design it would be thought that there would be a trend in the opposite direction and that the designer would endeavor, in the light of the higher piston speeds, to let the gases out of the cylinder earlier, to be sure that the pressure in the cylinder would have fallen to atmospheric by the time that the piston reached the bottom of the stroke. The longer stroke is no doubt responsible.

Exhaust valve closing is earlier in 1915 motors than it was in 1914, by nearly 3 degrees. This is also a significant fact as the relation of the inlet opening to the exhaust closing, in other words the lap is considered the most important feature in laying out the valve timing. The negative valve lap has increased on the average motor from -1.9 degrees in 1914 to -5 degrees in 1915.

There are three conditions of valve lap used in timing practice: negative, zero and positive. The decided trend is towards the use of a negative lap, that is one in which the closing of the exhaust does not lap over the opening of the intake. In 1914, 66.6 per cent. of the motors had negative lap. For 1915, 69 per cent. are using the negative lap. Zero lap, in which the inlet valve opens at the same time that the exhaust valve closes was used on 11.9 per cent. in 1914, it is used on 19.3 per cent. in 1915. Positive lap where intake and exhaust valves remain open together during the year has fallen off from 21.5 per cent. to 11.7 per cent.

The three conditions of negative zero and positive lap in valve timing give rise to definite sets of conditions in the cylinder. With negative lap, which is the general condition, the exhaust valve closes an appreciable period before the inlet opens. This permits the piston to descend slightly on the suction stroke before the inlet valve opens, thus creating a vacuum in the combustion space. When the inlet valve opens the rush of gases into the cylinders is accentuated by the fact that they are entering a partial vacuum.

With zero lap there is no vacuum in the cylinder at the time of the inlet valve opening, theoretically speaking. The inlet gases are drawn directly by the piston which has generally started on its downward stroke, except in such cases where the position of zero lap is on upper dead center.

With positive lap, both exhaust and inlet are open together for the period of the lap. The theory of this timing arrangement is that the inertia of the exhaust gases passing through the exhaust port is sufficiently great to create a partial vacuum in the combustion space. This aids the intake in the same manner as the negative lap would do. Owing to the condition that the exhaust and inlet gases should not conflict in their direction with positive lap, it is generally used on T-head motors. The falling off in percentage of T-heads is doubtless in some degrees responsible for the falling off in the percentage of those using positive lap.

The motors using zero lap are Abbott, Buda, Cadillac eight, Case, Chalmers, King eight, Continental, Herschell-Spillman, Kline, Lexington, Lyons-Knight, McFarlan, Maxwell, Metz,

National, Pratt, Premier, Saxon, Teetor and Vulcan. The point of inlet valve opening and exhaust valve closing on cars using the zero lap varies through a wide range. Cadillac, King and Case are examples of where makers have found it wise to open the inlet and close the exhaust on upper dead center. The latest timing for the zero lap is on the Saxon where the coinciding valve time falls at 12 degrees past upper center. The use of the upper dead center on the Cadillac is interesting as it is the first clue as to the timing requirements of an eight.

Those who still adhere to the positive lap are Auburn, Briscoe, Coey, Cunningham, Dorris, Franklin, Herff-Brooks, Locomobile, Paige, Simplex and Overland. It is interesting to note that three of these, Cunningham, Dorris and Franklin are overhead motors.

The greatest positive lap used on any car is in the Locomobile. This concern keeps both the exhaust and intake open during a period of 16 degrees and 27 minutes. Closely following this is Simplex which has an overlapping period of

16 degrees and 26 minutes. The smallest overlap is 5 degrees which is used on Briscoe, Dorris and Herff-Brooks motors.

The question as to whether the average timing for the four would vary much from that of the six can be answered in the negative. The timing diagrams at the head of page — bring out the small difference very clearly. On the six the inlet opens at 10.7 degrees past upper center and closes at 35.6 degrees past lower center. On the four it opens at 11.1 degrees before upper center and closes at 36.8 degrees past lower center. The difference of .4-degree on inlet opening and 1.2-degree on inlet closing would never be noticed in piston travel and would hardly make the difference of the thickness of a center-punch mark on the flywheel.

In exhaust valve practice the difference is also too small to be noticed. The exhaust on the average six opens at 46 degrees before lower center and on the average four is within .3 degree at 46.3. The difference in the points of exhaust closing is also less than a degree, being 7 degrees after top center on the six and 7.7 on the four.

Valve Timing of American Motors

| Name | Model | Cyls. | Bore | Stroke | Inlet Ops. Deg. Past Top Center | Inlet Cls. Deg. Past Bot. Center | Exh. Op. Deg. Before Bottom Center | Exh. Cls. Deg. After Top Center |
|-----------------------------|-------------|-------|-------|--------|--|---|---|--|
| Abbott | F-P | 6 | 3 3/4 | 5 1/2 | 10 | 28 | 49 | 2.5 |
| | L | 4 | 4 1/2 | 5 1/2 | 17 | 29 | 42 | 8 |
| | K | 4 | 4 1/2 | 5 1/2 | 11 | 44 | 45 | 11 |
| Allen | 33 | 4 | 3 1/2 | 5 | 15 | 49 | 45 | 10 |
| | 34 | 4 | 3 1/2 | 5 | 15 | 49 | 45 | 10 |
| | 35 | 4 | 3 1/2 | 5 | 15 | 49 | 45 | 10 |
| | 40 | 4 | 4 1/2 | 5 | 15 | 40 | 45 | 10 |
| Alter Car | BB-31 | 4 | 3 1/2 | 4 1/2 | 10 | 49 | 50 | 6 |
| Arge | | 4 | 2 3/8 | 4 | 26 | 4 | 40 | 5 |
| Auburn | 36 | 4 | 3 1/2 | 5 | 21 | 30 | 44 | 10 |
| | 6-40 | 6 | 3 1/2 | 5 | 21 | 39 | 43 | 12 |
| | 6-47 | 6 | 3 1/2 | 5 1/2 | 17 | 47 | 50 | 13 |
| | 43 | 4 | 4 1/2 | 5 | 5-30 | 36 | 71 | 15 |
| Beaver | K | 4 | 2 3/4 | 4 | 10 | 35 | 55 | 5 |
| | ML | 4 | 3 1/2 | 5 | 10 | 30 | 45 | 5 |
| | 6A | 6 | 3 1/2 | 5 | 10 | 25 | 38 | 8 |
| | 6B | 6 | 4 | 5 | 10 | 25 | 38 | 8 |
| | 4A | 4 | 3 1/2 | 5 | 10 | 25 | 38 | 8 |
| | 4B | 4 | 4 | 5 | 10 | 25 | 38 | 8 |
| | E | 4 | 4 1/2 | 5 1/2 | 10 | 35 | 42 | 8 |
| | N | 6 | 3 1/2 | 5 | 10 | 30 | 45 | 5 |
| Briggs | C | 4 | 3 1/2 | 5 | 5 | 25 | 25 | 2.5 |
| Briscoe | A | 4 | 3 1/2 | 5 1/2 | 0 | 45 | 47 | 5 |
| Buda | M | 4 | 3 1/2 | 4 1/2 | 15 | 33 | 53 | 12 1/2 |
| | O | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | T | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | Q | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | QM-3 | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | TM-3 | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | OM-3 | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | OU | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | TU | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | QU | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | R | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | RU | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | V | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | VU | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | SS | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | SSU-3 | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | SSU-4 | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | LS | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | LSU | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| Buick | C-24, C-25 | 4 | 3 1/2 | 3 1/2 | 16-11' | 35-41' | 56-19' | 13-11' |
| | C-36, C-37 | 4-6 | 3 1/2 | 5 | 14-5' | 36-25' | 56-51' | 11-29' |
| | C-54, C-55 | 4-6 | 3 1/2 | 5 | 14-5' | 36-25' | 56-51' | 11-29' |
| Cadillac | 8 | 8 | 3 1/2 | 5 1/2 | 0 | 46-40' | 46-40' | 0 |
| Cartercar | 9 | 4 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| Case | 40 | 4 | 4 1/2 | 5 1/2 | 13 | 30 | 50 | 13 |
| | 35 | 4 | 4 1/2 | 5 1/2 | 0 | 30 | 45 | 0 |
| | 25 | 4 | 3 1/2 | 4 1/2 | 10 | 30 | 40 | 5 |
| Chadwick | 19 | 6 | 5 | 6 | 18 | 85 | 75 | 0 |
| Chalmers | 26B | 6 | 3 1/2 | 5 1/2 | 12 | 33 | 55 | 12 |
| | 29 | 6 | 4 | 5 1/2 | 12 | 33 | 55 | 12 |
| Coey | A | 4 | 2 3/4 | 4 | 6 | 38 | 44 | 10 |
| Cole | Stand. Four | 4 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| | Light Six | 6 | 3 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| | Big Six | 6 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| Continental | 6F, 6A, 6-C | 6 | | | 10 | 28 | 40 | 2-30' |
| | 6-N, 6-P | 4 | | | 11-30 | 44-12' | 45-48' | 11-30 |
| | C-R | 4 | | | 17-53' | 29-25' | 42-36' | 8-20' |
| | E.J.N.T. | 4 | | | | | | |
| Corbitt | F | 4 | 3 1/2 | 5 1/2 | 12-42' | 44-12' | 45-48' | 11-30' |
| Crescent | | 4 | 4 | 6 | 12 | 35 | 50 | 5 |
| | | 6 | 4 | 6 | 12 | 35 | 50 | 5 |
| Cunningham | R | 4 | 4 1/2 | 5 1/2 | 10 | 50 | 50 | 20 |
| Cycleplane | Tourist | 4 | 2 1/2 | 4 | | | | |
| | Roadster | 4 | 2 1/2 | 4 | | | | |
| | Traveler | 2 | | | | | | |
| | | | | | Herman Motor | Herman Motor | Herman Motor | 14, but not as yet decided for 15. |
| Davis | SB | 4 | 2 1/2 | 4 | 10 | 35 | 55 | 5 |
| | MB | 2 | 5 1/2 | 4 | 10 | 27 | 47 | 5 |
| | FA | 4 | 4 1/2 | 6 1/2 | 10 | 30 | 47 | 5 |
| | Y | 4 | 5 | 6 1/2 | 10 | 30 | 47 | 5 |
| Dayton | | | | | 10 | 24 | 45 | 5 |
| De Luxe | V | 2 | 3.50 | 3.67 | 6 | 32 | 42 | 6 |
| Dile | A | 4 | 2 1/2 | 4 | 15 | 37 | 60 | On center |
| Dispatch | Roadster D | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | Touring G | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | Coupe H | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | Convertible | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | N | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | Express L | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| Dorris | 1-A-4 | 4 | 4 1/2 | 5 | 10 | 30 | 45 | 15 |
| Empire | 31-40 | 4 | 3 1/2 | 4 1/2 | 15 1/2 | 35 | 38 | 12 |
| Falls | B | 4 | 4 1/2 | 5 | 20 | 30 | 40 | 12 |
| | C | 4 | 4 1/2 | 4 1/2 | 15 | 33 | 53 1/2 | 12 |
| | F-1 | 4 | 3 1/2 | 5 | 15 | 33 | 53 1/2 | 12 |
| | F-2 | 4 | 4 | 5 | 15 | 33 | 53 1/2 | 12 |
| Farmer | A | 4 | 3 1/2 | 4 | 12 | 38 | 44 | 6 |
| | B | 6 | 3 1/2 | 4 1/2 | 15 | 30 | 38 | 3 |
| Ford | T | 4 | 3 1/2 | 4 | 12 | 50 | 37 | Closes on top |
| Franklin | 6-30 | 6 | 3 1/2 | 4 | 8 | 33 | 51 1/2 | 17 |
| Glide | 30 | 4 | 3.5 | 5 | 15 | 38 | 45 | 10 |
| Golden-Belknap & Swartz Co. | A | 4 | 3 1/2 | 3 1/2 | 10 | 40 | 50 | 6 |
| | B-25 | 4 | 3 1/2 | 4 1/2 | 10 | 40 | 50 | 6 |
| | B-31 | 4 | 3 1/2 | 4 1/2 | 10 | 40 | 50 | 6 |
| | C | 4 | 3 1/2 | 3 1/2 | 10 | 40 | 50 | 6 |
| | D | 4 | 3 1/2 | 4 1/2 | 10 | 40 | 50 | 6 |
| | E | 4 | 3 1/2 | 4 1/2 | 10 | 40 | 50 | 6 |
| | F | 4 | 3 1/2 | 4 1/2 | 10 | 40 | 50 | 6 |
| Grant | M | 4 | 2 1/2 | 4 | 15 | 40 | 45 | 10 |

Timing of American Motors—Continued

| Name | Mode | Cyls. | Bore | Stroke | Inlet Ops. Deg. Past Top Center | Inlet Cls. Deg. Past Bot. Center | Exh. Op. Deg. Bef. Bottom Center | Exh. Cls. Deg. Aft. Top Center |
|--------------|----------------|-------|-------|--------|--|---|---|---|
| Gt. West | 50 | 4 | 4 1/2 | 5 1/2 | 10 | 25 | 45 | 5 |
| | Carter | 4 | 3 1/2 | 5 1/2 | 42 | 46 | 50 | Dead center |
| Haynes | 30 | 4 | 3 1/2 | 5 | 5 | 35 | 47 | 2 |
| | 31 | 4 | 4 1/2 | 5 1/2 | 5 | 35 | 48 | 3 |
| | 32 | 4 | 4 1/2 | 5 1/2 | 5 | 35 | 48 | 3 |
| Hazard | C | 4 | 3 1/2 | 4 1/2 | 11 | 35 | 45 | 3 |
| | CX | 4 | 3 1/2 | 4 1/2 | 11 | 35 | 45 | 3 |
| | D | 4 | 4 1/2 | 6 | 14 | 30 | 44 | 8 |
| Herff-Brooks | 4-40 | 4 | 4 1/2 | 5 | On top cent. | 34 | 50 | 5 |
| | 6-50 | 6 | 4 | 4 1/2 | | 34 | 50 | 5 |
| Herschell | 4404-A | 4 | 2 3/4 | 4 5/8 | 14 1/2 | 40 | 44 1/2 | 10 |
| | 4402-J | 4 | 4 1/2 | 5 1/2 | 2 | 40 | 45 | On center |
| | 4403-N | 4 | 4 1/2 | 5 1/2 | 8 | Before | 45 | 8 |
| | 4401-J | 4 | 4 1/2 | 5 1/2 | 2 | 40 | 45 | Center |
| | 4301-E | 6 | 4 1/2 | 5 1/2 | 2 | 40 | 45 | Center |
| | 4001-M | 6 | 4 | 5 | 8 | 40 | 45 | Center |
| | 4101-S | 6 | 4 | 5 1/2 | 8 | Before | 45 | 8 |
| | 4405-C | 4 | 5 1/2 | 6 | 2 | 40 | 45 | Center |
| | 4201-B | 6 | 5 1/2 | 6 1/2 | 2 | 40 | 45 | Center |
| | 6201 | 4 | 6 1/2 | 8 | 2 | 40 | 45 | Center |
| | 6301 | 6 | 6 1/2 | 8 | 2 | 40 | 45 | Center |
| Hupmobile | K | 4 | 3 1/2 | 5 1/2 | 11 | 43 | 38 | 6 |
| | H | 4 | 3 1/2 | 5 1/2 | 25 | 35 | 40 | 20 |
| Jackson | Olympic, 46 | 4 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| | 48-Six | 6 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| Jeffery | 93-2 | 4 | 3 1/2 | 5 1/2 | 18 | 46 | 47 | 15 |
| | 104 | 6 | 3 | 5 | 15 | 50 | 45 | 10 |
| | 106 | 6 | 3 1/2 | 5 1/2 | 18 | 46 | 47 | 15 |
| King | C | 4 | 3 1/2 | | 9-43'-40" | 30-38'- 20" | 32-10'- 20" | 5 |
| Kline | 6-42, 5-pass | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| | 6-42 A, 7-pass | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| Krit | O | 4 | 3 1/2 | 4 | 8 | 31 1/2 | 39 | 2 |
| | M | 4 | 3 1/2 | 4 | 8 | 31 1/2 | 39 | 2 |
| L.P.C. Lewis | Six | 6 | 3 1/2 | 6 | 15 | 32 | 39 | 10 |
| Lex-Howard | 6M | 6 | 4 1/2 | 5 1/2 | 10 | 28 | 40 | 2 1/2 |
| | 6L | 6 | 3 1/2 | 5 | 10 | 28 | 40 | 2 1/2 |
| | 4K | 4 | 3 1/2 | 5 1/2 | 10 | 20 | 44 | 10 |
| Locomobile | R-4, 38 H.P. | 6 | 4 1/2 | 5 | Top cent. | 46-22 | 50-52' | 16-27' Aft. bot. cent. |
| | M-5, 48 H.P. | 6 | 4 1/2 | 5 1/2 | Top cent. | 48-30' | 56-10' | 15-39' |
| Lyons-Atlas | K-4 | 4 | 4 1/2 | 5 1/2 | 5 | 36 | 63 | 5 |
| McFarlan | T | 6 | 4 | 6 | 10 | 32 | 47 | 10 |
| | X | 6 | 4 1/2 | 6 | 10 | 32 | 47 | 10 |
| Marmon | 41 | 6 | 4 1/2 | 5 1/2 | 19 | 40 | 56 | 12 |
| | 48 | 6 | 4 1/2 | 6 | 16 | 40 | 56 | 12 |
| Mason | Z | 4 | 4 | 5 | 15 | 35 | 45 | 11 |
| Maxwell | 25 | 4 | 3 1/2 | 4 1/2 | 6 | 32 | 43 | 6 |
| Metz | 22 | 4 | 3 1/2 | 4 | 7 | 40 | 44 | 7 |
| Moline | New Series | 4 | 4 | 6 | 20 | 50 | 50 | 5 |
| Morse | B | 4 | 4 1/2 | 5 | 12 | 35 | 70 | 10 |
| | C | 4 | 4 1/2 | 5 | 12 | 35 | 70 | 10 |
| | D | 4 | 4 1/2 | 5 | 12 | 35 | 70 | 10 |
| Moyer | B & E | 4 | 4 1/2 | 5 | 1 1/2* | 6 1/10* | 6 1/4* | 1 1/2* |
| | G & H | 6 | 4 1/2 | 5 | 1 1/2 | 6 1/10 | 6 1/4 | 1 1/2 |
| National | AA | 6 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| Northway | 39 | 4 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| | 40 | 6 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |
| | 47 | 4 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| | 49 | 6 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| | 30 | 4 | 3 | 4 1/2 | 15 | 38 | 45 | 10 |
| Oakland | 37 | 4 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| | 49 | 6 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| Oldsmobile | 42 | 4 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| | 55 | 6 | 4 1/2 | 5 1/2 | 15 | 38 | 45 | 10 |

| Name | Model | Cyls. | Bore | Stroke | Inlet Ops. Deg. Past Top Center | Inlet Cls. Deg. Past Bot. Center | Exh. Op. Deg. Bef. Bottom Center | Exh. Cls. Deg. Aft. Top Center |
|-----------------|------------|-------|-------|--------|--|---|---|---|
| Paige-Detroit | 6-46 | 6 | 3 1/2 | 5 1/2 | 10 | 28 | 40 | 2 1/2 |
| | 4-36 | 4 | 4 | 5 | 11-20' | 40-26' | 51-18' | 11-40' |
| Partin | 20 | 4 | 3 1/2 | 4 | 18-14' | 52-28' | 56-43' | 12-55' |
| Paterson | 4-32 | 4 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| | 6-48 | 6 | 3 1/2 | 5 | 15 | 38 | 45 | 10 |
| Peerless | 48-6 | 6 | 4 1/2 | 6 | 8-40' | 30-21' | 43-53' | 3-55' |
| | 54 | 4 | 3 1/2 | 5 | 17-53' | 29-25' | 42-36' | 8-20' |
| | 55 | 6 | 3 1/2 | 5 | 17-53' | 29-25' | 42-36' | 8-20' |
| Pittsfield | | 4 | 4 1/2 | 5 1/2 | 20 | 30 | 50 | 10 |
| | | 4 | 2 1/2 | 4 1/2 | 5 | 30 | 50 | 5 |
| | | 6 | 3 | 5 | 10 | 30 | 50 | 5 |
| Pratt | Six-cyl. | 6 | 3 3/4 | 5 1/2 | 10 | 28 | 45-48' | 2 1/2 |
| | 50 | 4 | 4 1/2 | 5 1/2 | 11-30' | 44-12' | 49 | 11-30' |
| Premier | A | 6 | 3 5/8 | 5 1/2 | 10 | 40 | 40 | 10 |
| Pullman | 6-48 | 6 | 3 3/4 | 5 1/2 | 10 | 28 | 40 | 2 1/2 |
| R.C.H. | K | 4 | 3 1/2 | 5 1/2 | 18-12' | 52 | 35 | 11-30' |
| Regal | D | 4 | 3 3/4 | 5 | 10 | 38 1/2 | 46 1/2 | 5 |
| | D-1915 | 4 | 3 3/4 | 5 | 10 | 38 1/2 | 46 1/2 | 5 |
| Remington | R | 4 | 2 3/4 | 4 1/2 | 10 | 7 | 22 | 3 |
| Reo | R & S | 4 | 4 1/2 | 4 1/2 | 17-46' | 36-25' | 53-18' | 14-13' |
| Republic | F R | 6 | 4 1/2 | 5 | 15 | 30 | 45 | 10 |
| | B | 4 | 4 1/2 | 5 | 15 | 45 | 45 | 10 |
| Rutenber | 38 | 4 | 4 1/2 | 5 1/2 | 15 | 50 | 50 | 10 |
| | 28 | 6 | 3 1/2 | 5 1/2 | 18 | 46 | 47 | 15 |
| | 27 | 4 | 3 1/2 | 5 1/2 | 18 | 46 | 47 | 15 |
| | 22 | 6 | 3 | 5 | 15 | 50 | 45 | 10 |
| Saxon | B | 4 | 2 1/2 | 4 | 12 | 45 | 55 | 12 |
| Scripps | S | 4 | 2 1/2 | 4 | 18-53' | 47-31' | 43-25' | 15-45' |
| Simplex | 30 H.P. | 4 | 4 1/2 | 6 1/2 | 10-59' | 33-12' | 56-52' | 8-13' |
| | 50 H.P. | 4 | 5 1/2 | 6 1/2 | 13-49' | 36-4' | 60 | 16-26' |
| | 75 H.P. | 4 | 5 1/2 | 6 1/2 | On dead center | 41-51' | 66-24' | 16-26' |
| Spaulding | H | 4 | 4 1/2 | 5 1/2 | 5 | 45 | 48 | 4 1/2 |
| Speedwell | Rotary | 6 | 4 1/2 | 5 1/2 | 10 Be- fore up dead center | 30 | 46 | 1.6 |
| Sphinx | A-15 | 4 | 3 1/2 | 5 | 3 | 35 | 45 | 5 |
| Stearns | SK-4 | 4 | 4 1/2 | 5 1/2 | 4 | 40 | 60 | At center |
| | SK-6 | 6 | 4 1/2 | 5 1/2 | 4 | 40 | 60 | At center |
| | SK-L4 | 4 | 3 1/2 | 5 1/2 | 8 | 40 | 60 | 4 |
| Studebaker | Six | 6 | 3 1/2 | 5 | 12-30' | 32-30' | 45 | 7-30' |
| | Four | 4 | 3 1/2 | 5 | 12-30' | 32-30' | 45 | 7-30' |
| | EC | 6 | 3 1/2 | 5 | 12-30' | 32-30' | 45 | 7-30' |
| | SD | 4 | 3 1/2 | 5 | 12-30' | 32-30' | 45 | 7-30' |
| Teetor-Hartly | AA | 4 | 3 7/8 | 5.00 | 10 | 20 | 44 | 10 |
| | BB | 6 | 3 5/8 | 5.25 | 10 | 20 | 44 | 10 |
| | C | 4 | 3 8/8 | 5.375 | 10 | 20 | 44 | 10 |
| | T | 6 | 4 5/8 | 6.00 | 10 | 35 | 44 | 10 |
| Trumbull | 15-B | 4 | 2 1/2 | 4 | 10 | 24 | 45 | 5 |
| Twombly | Town Car E | 4 | 2 1/2 | 4 | | | | |
| Velie | 15 | 6 | 3 1/2 | 5 | 10 | 28 | 40 | 2 1/2 |
| | 14 | 6 | 3 1/2 | 5 1/2 | 10 | 28 | 40 | 2 1/2 |
| | 12 | 4 | 4 1/2 | 5 1/2 | 7 | 36 | 43 | 12 |
| | | | | | Ahead | | | |
| Vulcan | 35 | 4 | 3 1/2 | 5 1/2 | 5 | 45 | 55 | 5 |
| Westcott | 0-30 | 4 | 3.5 | 5 | 15 | 38 | 45 | 10 |
| Willys-Overland | 80 | 4 | 4.125 | 4.500 | 8 | 38 | 46 | 15 |
| | 81 | 4 | 4.000 | 4.500 | 8 | 38 | 46 | 15 |
| | 82 | 6 | 3.500 | 5.250 | 10 | 28 | 40 | 2 1/2 |
| Winton | 21 | 6 | 4 1/2 | 5 1/2 | 20-45' | 35-30' | 54-40' | 15-30' |
| Wisconsin | A | 4 | 4 1/2 | 5 1/2 | 15 | 45 | 45 | 10 |
| | B | 4 | 4 1/2 | 5 | 15 | 45 | 45 | 10 |
| | C | 4 | 3 1/2 | 5 | 15 | 55 | 45 | 10 |
| | D | 4 | 4 1/2 | 7 | 15 | 45 | 45 | 10 |
| | E | 4 | 4 | 5 | 15 | 55 | 45 | 10 |
| | F | 6 | 4 1/2 | 5 | 15 | 30 | 45 | 10 |
| | H | 6 | 3 3/2 | 5 1/2 | 15 | 35 | 55 | 5 |
| | K | 6 | 5 1/2 | 7 | 15 | 30 | 45 | 10 |
| | M | 4 | 5 1/2 | 7 | 15 | 45 | 45 | 10 |
| | P | 6 | 5 1/2 | 7 | 15 | 30 | 45 | 10 |

*Inches on flywheel.

1915—A 7-League Stride in Car Design

(Continued from page 1193)

per cent., use cantilever springs, and 45 per cent. of those using cantilevers drive through the spring. In plain figures, ten manufacturers out of 119 drive their cars through cantilever springs.

Analyzing first the method of taking the drive through the springs, there are two classes: those who employ the Hotchkiss drive, and those who do not. The Hotchkiss drive is that in which not only the forward propulsive thrusts are taken but in which the torque is also absorbed by the springs. Some of the cars which use the pure Hotchkiss drive are the Oakland, Imperial, Stearns, Apperson, Hudson, Haynes, Westcott, Empire, Cadillac and Mitchell. Those who use it favor it for its flexibility, primarily, and second for the saving in weight. This drive is not altogether new. Apperson had a car in the Savannah race of 1908 with this type of drive in connection with semi-elliptic springs. The way the springs are generally mounted on the Hotchkiss drive is to rigidly attach them to the rear axle with the front end secured by an unusually large bolt, through which the drive is transmitted. This bolt is of course securely anchored in a bracket, which is in turn riveted to the frame.

Spring Drive Flexible

There are advantages gained by the absence of several joints and shackles which are necessary with other types of drives. It is stated that it is bound to be quieter because it is more flexible and also that the car holds the road better with this drive. All companies using the drive advance practically the same reasons for its use, especially emphasizing the fact that the road shocks which would sometimes be communicated from the axle to the frame through stiff torque members are eliminated.

The amount of weight saved by using the Hotchkiss drive is estimated variously by different concerns. Oakland says 20 pounds, Imperial, on the other extreme, says 200 pounds. Between these figures there are Hudson, 50 pounds, and Haynes, from 25 to 50 pounds. Cadillac believes that the weight saved is the lower limit of 20 pounds. As regards the efficiency of the drive concerning slippage of the wheels, the general opinion is that there is no difference, although others believe differently, advancing as a reason that the taking up of the flexure in the springs eliminates slippage in starting and braking.

Cars which take the drive through the springs but the torque through other members state that they gain the advantage for flexibility in drive with the elimination of side sway and other strains. The big objection that those using the drive through the springs advance against the radius rods is the argument that these are apt to rattle. The fact that radius rods are used on 20 per cent. of the makes, however, would indicate that there are two well developed sides to this question which is still in the argumentative stage.

Many Using Cantilevers

The concerns which have adopted cantilever springs are Grant, Jeffery, King, Lexington, McIntyre, National, Paige, Pathfinder, Pilot, Pullman, Scripps-Booth, Singer, Sphinx, Stearns, Trumbull, Twombly, Westcott and Willys-Knight. Its chief advantage as a means of suspension is the lack of sharp rebounds. Beyond this, the other advantages are reduction of unsprung weight, a greater deflection for pound load, greater flexibility and the elimination of the cut in the body necessary with the three-quarter elliptic.

Whether the cantilever spring is used in connection with

some sort of driving or radius rods to take the thrust of propulsion from the rear axle to the frame, or whether the cantilever is used as a drive member has much to do with its construction. When used for the drive, as for suspension, it is customary to stiffen the main leaf of the spring. When a torque tube or torque rods are used to take the starting and braking torque the main leaf is lighter.

The reasons for using the cantilever form of support are various. The cantilever springs allow a great range of action for a given length of spring, are more resilient, have more internal friction and hence show less need for shock absorbers. They are especially adapted for taking thrusts but not torque. The reason is that in comparison with other springs there is more metal in the line of thrust than in any other type. This allows for greater beam strength and a greater possibility of eliminating side sway. It is of course recognized that the amount of strength of the units taking the drive varies directly with the modulus of the section of the material in the line of drive.

As compared with the semi-elliptic the comparison is made that almost the entire spring weight of the semi-elliptic is unsprung, whereas in the cantilever it is practically all sprung weight, tending to make riding easier.

Wire Wheels Gain Slowly

While there is a slow increase in wire wheels, there is nothing like the deluge that was predicted a year ago. Only 7 per cent. are equipped with them regularly and 4.5 per cent. may offer them as an option. Some of those who fit them regularly are: F. R. P., Grant, Pullman, Scripps-Booth, Saxon, Twombly and Willys-Knight. Some who give them as an option are: Briscoe, Fiat, Lenox, Locomobile, Moline, Owen and Singer. This gives 11.5 per cent. as the maximum percentage of cars on which wire wheels can be secured at the regular purchase price. The wire wheels used are of the demountable and detachable types, and are distinguished by the fact that they are of lighter weight than the earlier wire wheels. The weight per wheel of a demountable 34 by 4 is 29.75 pounds for the light type and 31.25 pounds for the medium weights. For the heavy-weight rims, which are not as often used, the weight of the demountable wheel complete is given as 43.75 pounds. This is 203 pounds per set. These weights are for the number 3, 30 and 40 demountables manufactured by the Standard Welding Co. They may be taken for a fair sample of demountable wire wheel practice as it is at the present time.

More than half the chassis now have the gasoline tank at the rear. This is accounted for by the sudden growth of the vacuum feed system. In 1914 vacuum feed for gasoline was quite obscure, but this season more than 20 per cent. use it. The result in tank location has been the increase of rear tanks from 41 per cent. for 1914 to 51.1 per cent. for 1915. Cowl tanks have also increased from 13 per cent. for 1914 to 27.2 per cent. for 1915. Tanks under the seat are the losers. In 1914 46 per cent. had them in this location; in 1915 there are but 21.2 per cent. of underseat tanks. The vacuum feed means in reality a gravity feed to the carburetor, as the vacuum part of the system sucks the gasoline from the rear tank to a small tank on the dash or under the hood.

Pressure Feed Used Less

As would naturally be expected, from the shifting of tanks pressure feed has dropped, but reached its zenith in 1914, when 41 per cent. fed by pressure. In 1910 18 per cent. used

the pressure feed system, and this grew to 19 in 1911, 25 in 1912, 35 in 1913 and 41 in 1914. In 1915 only 22 per cent. use the pressure feed. The Stewart-Warner vacuum feed is employed on 20.5 per cent., a position which it has gained within a year because in 1913 no cars were fed in this manner. The pressure-gravity fuel system, in which the fuel is fed by pressure to a gravity dash tank, has not taken a very strong root. Chalmers has it on one model, and this is about the extent of its use. The vacuum feed is used on all classes of cars, not merely on low-priced, high-priced or intermediate. It is used on all sizes of cars, and the number of manufacturers who have adopted it number more than 30, practically a quarter of the industry.

This method of feeding the carbureter has been adopted after experimenting to ascertain that the probability of mechanical troubles with the tank was very small. Its adoption generally eliminated a hand pump, a motor-driven air pump, two check valves and one line from the motor to the gasoline tanks. These parts, having to handle air at low pressures, are rather troublesome to keep tight and in good working order. The motor-driven air pump necessarily feeds a small quantity of engine oil through the pressure line to the tank, which makes trouble in cold weather by congealing. The vacuum feed furnished gasoline to the carbureter under a somewhat more uniform pressure than do the pressure feed systems.

Another advantage of the vacuum feed over the gravity with the tank in the cowl is due to the fact that the cowl tank must be soldered on account of its odd shape, with consequent danger of leak. It reduces the capacity of the gasoline supply, is noisy due to the splashing, is odorous, and it is inconvenient to fill. The vacuum feed retains the advantage of the gravity without these disadvantages.

Other reasons are on account of the low body lines necessary for an up-to-date car, and this necessarily cuts down the available space beneath the front seat. It has been mentioned in the motor review that one of the great advantages of the vacuum feed system is in the raising of the carbureter permitting greater accessibility.

Left Drive and Center Control

The movement towards left drive and center control which started in 1910 has continued without cessation. In 1910 but 2 per cent. used this combination; in 1915 79.5 per cent. are so driven and controlled. Right drive and right control have been traveling down the scale in about the same ratio as left drive and left control have been ascending. In 1910 93 per cent. had right drive and right control; in 1915 9.5 per cent. have remained faithful to their convictions in this respect. Right drive with central control went up the scale from 1910 to 1912 from 4 to 15 per cent. Since then it has fallen away until now but 3 per cent. use it. Makers who still maintain left control are 3.5 per cent. This has been almost constant since 1910. At that time it was 1 per cent., in 1911, and 1912 it was 2 per cent., in 1913 4 per cent. and 1914 2 per cent.

The high spots in starting and lighting systems, which will be fully treated later, are lighter weight, better electrical characteristics, better insulation, simpler meshing of starting motor to flywheel and quieter drive. Trends of design center around the simplifying of the electrical installation. An example of this is in the use of the single-wire system which is now on more than 70 per cent. of chassis using electric starting. The almost universal adoption of flywheel connection for the starter is another feature. In 1914 62 per cent. connected the starter to the flywheel. The percentage is now in excess of 85. The Bendix gear connection for the starting motor to the flywheel is another feature which is on the increase. Six-volt systems retain their supremacy. Those who are using the combined lighting, starting and ignition system are on the increase, and Delco has to its credit this

season over twenty-five installations on different chassis. Over 110 chassis, however, still continue to use the magneto.

In body work the movement towards the moulded design has been practically universal. The sloping hood and flush-sided body, with its low lines, has won popular approval for the sake of appearance.

Bodies are larger for two reasons: the engine bonnets are shorter. The result has been that more space can be devoted to seating capacity. The car for 1915 has more leg room in the forward compartment than its immediate predecessor. The width of tonneau seats has been increased and the 48-inch seat is common even on cars of low and medium price.

The touring car, as usual, holds its own. Under \$1,250 there are seven makers who specialize only on touring cars. These are Alger, Detroit, Dodge, Interstate, R. C. H., Sphinx and Vixen. Among the \$1,500 makes there is only one, Monarch. In the \$2,500 class only three makers specialize on the touring car alone. These are Luverne, Lyons-Knight and Speedwell.

As would naturally be expected, a concern would specialize on a runabout only among the cheaper cars. These are Argo, Dile, Herreshoff and Rayfield. Metz was one of these until the middle of December, when they announced a touring car, which was the first they had ever built.

Four-passenger bodies are manufactured by a number of concerns, but in the low-priced class. In the \$1,500 class, Cole, Corbitt, Crow, Great Western, Kline, Norwalk, Pratt and Velie make them. In the \$2,500 class, Crow, Great Western, Haynes, McFarland and Pratt sell four-passenger cars. Above \$3,000 there are Locomobile, Marmon, Pierce, Republic and Stearns. In the closed bodies Ford stands alone among those listing Sedans below \$1,250. Kissel is the only name found among those listing Sedans between \$1,250 and \$1,999. The cheapest limousines are in the \$2,500 class, which is represented in this respect by Hudson, Jeffery, Kline and Stearns.

Only two list landaulets below \$3,000. These are Cadillac and Hudson. There are six concerns listing Berlins, namely: Cadillac, Fiat, Franklin, Locomobile, Peerless and Stevens.

Equipment is better and lighter than ever. The one-person top is the feature this year, neglecting starting and lighting for the moment, on the low-priced cars. Practically every car is sold fully equipped at the purchase price. More cars have speedometers and clocks than ever before. One of the big points in equipment on the higher-priced cars for this year is the cord tire. Among the concerns who are furnishing them are White, Franklin, Pierce, Marmon and Owen. The gain in efficiency has been variously estimated. Franklin puts it at 18 or 19 per cent. in hill-climbing ability and states that tire mileages are much higher. Goodrich tests on the Silvertown cord show a 23.6 per cent. gain in coasting efficiency. Lower air pressures and less heating are also advantages.

Control Features Improved

The mounting of control features has been improved. Adjustable pedals are used almost universally. The dash instruments are better placed. Overland, during the year has gone over to the method of mounting the lighting, starting and ignition switches on the steering column.

With all this increase in comfort, economy, appearance and durability, the price of the car has gone down. Last year an upward trend was noticeable in the selling price of cars, but a study of the price chart shows that that price went up from \$2,214 for the average car in 1910 to \$2,560 in 1911. In 1912 it went down to \$2,508. In 1913 makers started to put on electric cranking and more equipment, so prices took a jump to \$2,585 that year. This tendency was continued for 1914, when the price reached the high-water mark of \$2,685. For 1915 it is about where it would have been if the downward trend of 1911 and 1912 had continued—\$2,005.

Vulcan Gearshift Stronger and Lighter

Magnetic Pull for Gearshifting Increased—Current Consumption Reduced—Endurance Test Demonstrates Stability

THE Vulcan electric gearshifter introduced last year, and which has been taken over by the Cutler-Hammer Mfg. Co., Milwaukee, Wis., is now being manufactured in an entirely changed form, incorporating, however, the original principle of the Vulcan, namely, that of sliding the gears on the shafts of the gearset by electro-magnetic force, and also having the entire control of gearshifting centralized in the center of the steering wheel. The design has been changed, including the solenoids, the size of the coils and the plungers. Added to this, the neutralizing device is different as is the selector switch and the master switch mechanism, in fact, little of the old Vulcan remaining except the name, and the employment of the basic principles.

20 Pounds Added to Car

In its improved form, the Vulcan shifter adds a total of 36 pounds to the gearset, but when the weight of the control lever and its protection are taken into consideration, the added net weight is little over 20 pounds. In its new form it is a lighter and more compact mechanism than formerly. It is also much stronger, in fact, so great is the increase in the electro-magnetic pull that the inspection of the coils of the electro-magnet includes the lifting of a 90-pound weight vertically with a 7-8-inch airgap. Any coil cannot lift this weight is rejected.

Little Current Required

The question of the amount of electric current needed in this gearshift work is frequently raised, but it can be considered a negligible quantity. So slight is the current needed that no appreciable drain on the starting or lighting battery is noticed, in fact it is stated that the total current consumed in shifting gears does not exceed .005 ampere-hour per shift or sufficient to supply a set of lamps 4.5 seconds.

Tested for Endurance

The Cutler-Hammer Co. has tested their present design out to the fullest, by attaching to a gearset driven by an electric motor. The gearshift was operated 60 times per minute, the tester pressing the buttons on the selector switch alternately. The device was operated in this way 294,491 times after which it was examined for indications of mechanical or electrical defects, and the closest inspection failed to show any indications of weakness or deterioration.

To secure some definite conception of the current consumption and to determine the number of shifts that could be made using a 12-volt, 80-ampere-hour battery without recharging, the same method of test was followed and 134,490 gearshifts made. Calculating on a basis of 100 shifts per day, 365 days per year, and considering the total number of operations, this test equals 4 years of constant car service.

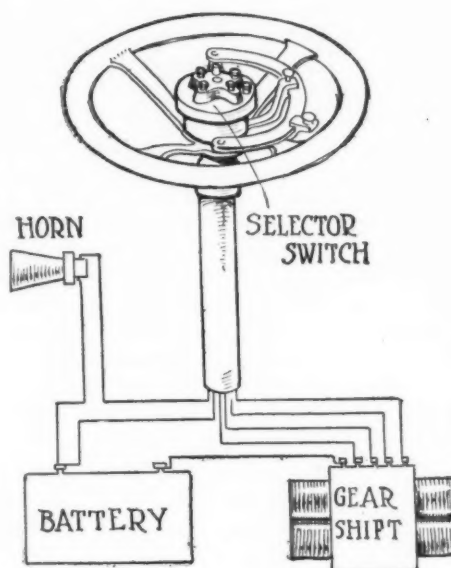


Fig. 1—Diagrammatic illustration of improved Vulcan electric gearshift, showing simplicity of wiring system

In describing the Vulcan gearshift it should be remembered that in making any gearshift by the conventional hand method the lever is used to slide a gear on one shaft into or out of mesh with a corresponding gear on a parallel shaft constituting a part of the gearset. With the Vulcan gearshifter these movements are accomplished by electro-magnetic force, there being a separate solenoid for each speed change. On the steering wheel is a series of buttons for selecting the gear desired.

Current is sent to the proper solenoid by a series of buttons in the center of the steering wheel, these buttons replacing the gearshift lever as the operating means. A master switch is interconnected with the clutch pedal in such a way that the solenoid is not energized until the clutch pedal is pressed clear out, a sufficient throw being allowed between the complete de-clutch position and the operation of the master switch, to permit throw-

ing out the clutch without shifting gears. In this way a speed combination may be predetermined by setting a button on the steering wheel, but the actual shifting of the gears does not occur until the clutch is thrown off at some later time.

The gearshift consists of two units: the shifting assembly or group of magnets attached to the gearset case and the selector switch, or push button group, located on top of the steering column in the center of the steering wheel.

The selector switch, which is carried on the wheel, is made up of a number of buttons, one for each speed and one for neutral which has no electrical connection. There also is a button in the center for operating the horn. The top of the switch carries a locking plate for locking any button which may be depressed and also carries an interlock which makes it impossible to press down more than one button at a time.

Wiring System

The wiring is simple. There is one lead passing from each coil through a terminal block to its particular speed button on the selector switch, and the other lead from the coil is joined to a neutral wire directly through the terminal block to the battery, with the master switch intervening. Another wire from the battery passes through the terminal block to the contact of the selector switch which is common to all speeds. The current travels from one terminal of the battery, through the depressed push button, around the coil selected and back to the other terminal of the battery.

The terminal block mounted on the shifted case is introduced in order to make it easy to remove the gearset without disturbing the wires. It is made up of the required number of male and female terminals for each speed. These are insulated from each other by fiber blocks, but are securely fastened together so as to be a unit. These terminals are each of a different size so that should it be desired to pull out

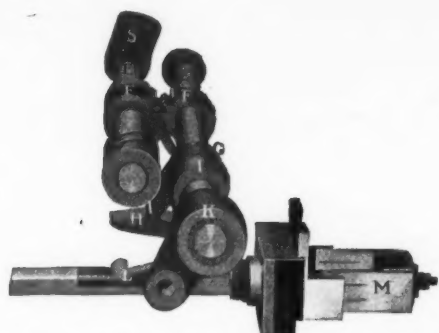


Fig. 2—End view of the shifting mechanism, including the neutralizing mechanism and the master switch

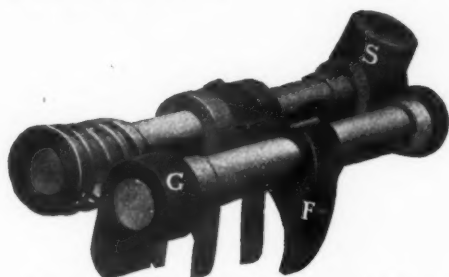


Fig. 3—Neutralizing mechanism unit of the Vulcan electric gearshift

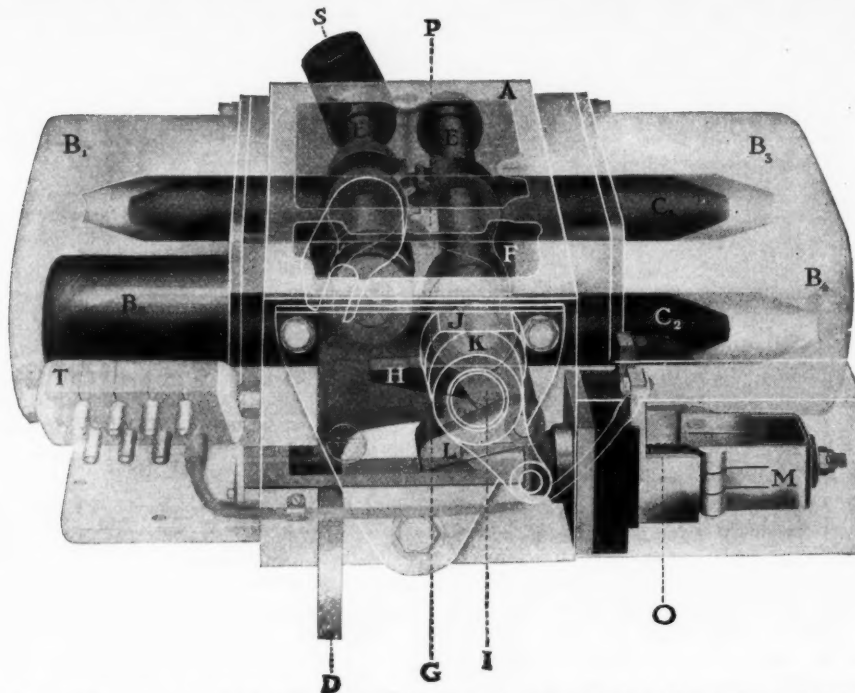


Fig. 4—Phantom view of the entire shifting mechanism used in the Vulcan electric system as it looks applied to a gearset

the wires there is no danger of getting them mixed up because no wire will go on any terminal except the right one.

Magnetic Pull Increased

It is pertinent here to point out some of the features wherein the Vulcan electric gearshift has been improved since its redesign by the Cutler-Hammer engineers. In the first place, the pull of the electric magnets has been greatly increased without increase of weight or size by a redesign of the housing of these magnets. Instead of having a separate case for each magnet, all the magnets on one side, two in the case of a three-speed gearset and three in the case of a four-speed gearset, have been covered by a common housing of cast iron which in addition to its protective function, forms a part of the magnetic field and thus increases the intensity of the magnetism and so increases the pull on the armatures. There are only two armatures or shifter rods for a three-speed gearset and each end is inclosed in a separate magnet winding. The pull has been further increased by a change in the shape of the ends of the pull rods or armatures. Formerly the ends of these armatures were flat, but they have been tapered off to a conical shape, so that the magnetic field becomes more intense as the armature nears the inner end of the coil or the end of its throw, this giving not only a stronger pull but a snappier one, the speed increasing as the motion proceeds.

Conserving the Current

Another improvement is in the interconnection of the master switch and the clutch pedal. In the early type the full battery current was flowing through the coils as long as the clutch pedal was completely depressed. This meant that sometimes the current was permitted to flow through the system after the gears had been shifted and the current thus wasted. In the new design the master switch is thrown out automatically when the action is completed, regardless of how long the clutch pedal might be depressed. This provides an additional saving of current. The whole equipment appears considerably more rugged and substantial than did the earlier type and probably offers less chance of disarrangement in service.

To take up the design and operation of the gearshift in detail reference is made to Figs. 2, 3 and 4, Fig. 2 being an

end view of the shifting mechanism including the neutralizing mechanism and master switch. Fig. 3 is a view of the neutralizing mechanism alone and Fig. 4 is a phantom view of the entire shifting mechanism as applied to a gearset, the arrangement shown here being that for the gears in third speed, that is, direct drive. In all three figures the letters refer to identical parts.

The electric gearshift mechanism consists of a case *A* attached to the gearset housing. This case carries the magnets or solenoids *B*, these in turn surround the armatures *C* on which are mounted the shifting forks *D*, which move the sliding gears. In this case, also, is carried the operative mechanism by means of which the gears are mechanically drawn to their neutral positions through a connection with the clutch pedal. The case *A* is divided into two compartments, the smaller of which is a pocket in which the mechanism for neutralizing the gears and operating the master switch are carried.

The neutralizing mechanism consists of two operating shafts *E* on which the neutralizing cams *F* are mounted. One of these shafts carried the pawl *G* which in turn engages with a latch *H*. This latch is carried on the rocker arm *I* which is mounted on the shaft *J*. Upon the opposite end of this shaft is mounted the operating lever *K* through which the connection with the clutch pedal is made. The rocker arm *I* also carries the switch operating pawl *L* which engages with the stem of the master switch *M*.

How the Mechanism Works

Assuming that all gears are in a neutral position and it is desired to start, the first speed button on the selector switch in the center of the steering wheel is depressed, closing one break in the electric circuit. The operating lever *K* and the shaft on which it is mounted are rotated and the master switch *M* is pulled into engagement through its connection with the operating mechanism *L* which engages the switch stem. As the gear moves into mesh, and is within 1-8 inch from being home, the pawl *G* falls back, due to the pull of the magnets against the neutralizing cams *F*, causing it to strike against the trigger *N* which is attached to the switch operating pawl *L*. This action causes the pawl *L* to be raised out of engagement with the stem of the master switch and

(Continued on page 1276)

The Improvement of Spring Suspension-III

By M. C. K.

(Continued from issue of December 10)

AS has been seen, the movements of a vehicle without springs or springy construction elements follow closely the inequalities of the road, and the objections to springless construction, which for thousands of years were obviated mainly by means of soft cushions and leather straps, lie in the severity of the shocks received and in the fact that the movements of the vehicle body and load are as large and as sudden as those of the running gear. The waste of driving power scarcely came under consideration till motor vehicles made their appearance. It is perhaps useful to notice that springs have not yet conquered universally in practice. They were not considered indispensable or even desirable for very smooth roads, such as railroads, until speeds became high and the wear and tear of rolling stock were systematically looked into, and for railroad practice their stroke is still sharply restricted, while devices for varying their flexibility according to the load are much more widely employed than is the case in other applications. On the other hand, practice has never fully ratified their use for speedy work on very rough roads, such as may be demanded of artillery. And they are considered superfluous if not harmful for very slow and heavy work on any kind of road. Their usefulness is in fact recognized mainly for medium speeds on roads of medium roughness, and the development now taking place is aimed at the expanding of their range of utility by changes in their construction.

Averages and Safety

These things are so perfectly well understood in a general way that they are seldom mentioned in detail, and their bearing upon the subject of improvement easily escapes attention. Especially, it seems to be overlooked sometimes that the springs, though intended to keep the load-level constant and to render all movements less abrupt, often cause the movements of the load to be, for a brief period, not only more numerous but also larger than they would be without the use of springs and, under certain less frequent combinations of road conditions and vehicle speed, even cause shocks more destructive and uncomfortable than those which would be received in a springless vehicle under the same road and speed conditions. While the beneficial average effects of springs make them indispensable, counting decisively when only comfort is considered, the exceptional effects can of course not be ignored when safety for structure, load and occupants is involved, as safety does not depend upon average effects but upon the extremes; not primarily upon wear or fatigue of metal, or other accumulative factors in deterioration, but upon accidental fractures.

Importance of Exceptions

As the advantages to be obtained by using springs are also invariably discounted in advance by building vehicles less robust than anybody would think of building them without springs, the extraordinary stresses which are produced exceptionally are eventually found to form a most important division of the subject, especially where utility vehicles are concerned, since in these the safety against fractures—of both vehicle and load—is the main object of spring suspension.

These rather obvious reflections drawn from well-known practice to assist in justifying a theoretical comparison of the things that take place under different conditions of vehicle construction, are suggested by the need of determining the

shocks and retardations occurring in the case of a springless vehicle, when, under the influence of a road obstacle, it describes the movement illustrated in Fig. 5.

Fig. 6 shows this movement again, with additional indications of the factors in shock and retardation.

The simplest manner of figuring is based on considering the kinetic energy which is abstracted from the moving vehicle and the speed which can be produced with what is left.

Exactness Illusory

Two methods have been proposed for estimating this retardation, any exact calculation being complicated by the wheel action and the irregular shape of a four-wheeled vehicle. Both methods are presented, the first one in small type.

It was seen that the front portion of the vehicle would make a leap 3.18 feet high to clear the 3-inch high obstacle, if only the velocities were decisive and no energy lost in shock. The energy required for such a leap, though it remains imaginary for a springless vehicle acting against a ridge of the shape under consideration, is therefore approximately equivalent to the energy abstracted for the vertical component of the shock at the front axle, although this energy in the absence of all elasticity is spent mostly in shock and only to a small degree in load lift. This is clear, as the force of the blow against the ridge does not depend upon what happens afterwards but only upon the vehicle and the road condition.

In accepting this method of figuring it is necessary to consider that the nature of a wheel permits the vehicle to clear the obstacle by following the lines of smallest resistance. But in assuming that axle B moves in a straight line to C instead of being compelled by friction at A to follow curve BC, and figuring the height of the leap as it would be if the straight line were followed, the horizontal element in AB is not considered, and it must therefore be figured separately, and the retardation involved in it must be added to that caused by the leap.

A leap which is arrested by gravitation at a height of 3.18 feet and involves a weight of 1,000 pounds represents the work of 3,180 footpounds and is numerically identical with the force required for imparting to 1,000 pounds an initial velocity of 14.25 feet per second. (This force is conceived as developed in 0.01755 second, during the contact of the wheel with the ridge, as referred to before, and this time element, indicating the greater or lesser violence expressed in speed, may not have an influence on the retardation, but in practice it means everything, almost, with regard to destructiveness).

The total energy of the vehicle being $\frac{1}{2}mv^2 = (3,000 : 64) \times 50^2 = 117,187$ footpounds, from which there is to be deducted 3,180 of the same units, the remaining speed v_1 of the vehicle is determined by the equation:

$117,187 - 3,180 = 114,007 = \frac{1}{2}mv_1^2 = (3,000 : 64) \times v_1^2$,
so that $v_1^2 = 64 \times 114,007 : 3,000$ and $v_1 = 8 \times \sqrt{38,002} = 8 \times 6.16 = 49.28$ feet per second.

The speed reduction due to the vertical component of the blow is thus 0.72 feet per second, but the horizontal component must also be figured.

It is seen directly from the diagram that the two components are in the proportion of 17 inches for the vertical one to 10.53 inches for the horizontal one, and, the vertical one being equal to 3,180 footpounds, the horizontal one would at first glance seem to equal 1,969.73 footpounds. But the value of the vertical component is obtained by figuring from the movement imparted to a weight of 1,000 pounds, while the horizontal thrust is determined by a body weighing 3 times as much. As a corrective to the graphic proportions, 3,180 footpounds may therefore be multiplied by 3, making 9,540 footpounds, and from this value the proportion of the horizontal component may be taken, making the latter $9,540 \times 10.53 : 27.53 = 3,643$ footpounds.

In the previous equation it was therefore $3,180 + 3,643 = 7,823$ which should have been deducted from 117,187, making $v_1^2 = 64 \times 109,364 : 3,000$ and $v_1 = 8 \times \sqrt{36,451} = 8 \times 6.04 = 48.32$ feet

per second, instead of 49.28, and the total speed reduction of the vehicle due to the passing of the front wheels over the obstacle 1.68 foot per second.

Out of the 7,823 footpounds of energy lost only $3'' \times 1,000$ pounds = $\frac{1}{4} \times 1,000$ pounds = 250 footpounds represent lift, while the rest, or 7,573 footpounds, represent shock, but no division in vertical and horizontal shocks can be figured from the data used.

The More Direct Way

The other and perhaps safer way of estimating the loss of kinetic energy, while also getting values for some other factors, is as follows:

If B were the center of gravity of the vehicle, the kinetic energy, 117,187 footpounds, would at the impact with A be resolved into two components, BA in the direction of resistance and another, BL, in the direction of possible movement. As the possible movement is an arc, BC, described with a 20 inch radius around A as the center, BL must be tangential to this arc and at a right angle with BA. As elasticity is supposed to be lacking, and no rebound therefore can take place from A, no other direction than BL is possible, and BL therefore would represent the energy remaining after the shock, turning with the wheel during the progress of the shock; and BA would represent the lost energy spent in shaking the earth and stressing the wheel and the rest of the vehicle. BA would have the value of $\frac{1}{2} mv^2 \times \cos \alpha$ and BL that of $\frac{1}{2} mv^2 \times \sin \alpha$, if the object were to determine forces equivalent to the original energy for driving the vehicle in the direction NB, but for the present purpose these values indicate only the proportions in which the total energy is divided.

It is also noticed that BL goes on increasing in value in

springs and tires is here at the same time brought into view).

It is not necessary to find α in degrees, as it is known that $20'' \sin \alpha = 17''$ and $20'' \cos \alpha = 10.53''$, and the same proportion holds good for any other radius than 20 inches. Dividing in this proportion, one has $BA = 117,187 \times 10.53 : 27.53 = \sim 44,750$ footpounds, and the mean between this and zero is 22,325 footpounds.

This figure for the lost momentum is however not in accordance with the data, as B is not the center of gravity of the vehicle but only the point at which the weight of 1,000 pounds is supported. To simplify the estimates, the center of gravity is supposed to lie in the line NB, and while horizontal shocks can be resisted at B by the energy of the whole vehicle and a mass determined by 3,000 pounds of material, the vertical shocks can be delivered only against 1,000 pounds. As action and reaction must be equal, the value for $BA = 22,325$ footpounds may therefore be modified by resolving BA into its horizontal and vertical components and dividing the latter by 3,000: 1,000 = 3. (It would be more correct to figure with the velocity imparted to 1,000 pounds at rest, but this is handier and perhaps near enough.)

The Wheel Action

Moreover, the horizontal component is affected by the rotation, or capacity for rotation, of the wheel; the situation is not the same as if a wheel fixed upon its axle were shoved over the ground. (This element enters, for rear wheels, if the obstacle is met a moment after the wheel has been locked by the brake—a frequent occurrence, perhaps accountable for accidents to springs and spring shackles). For normal driving, the horizontal component AH can be again resolved into

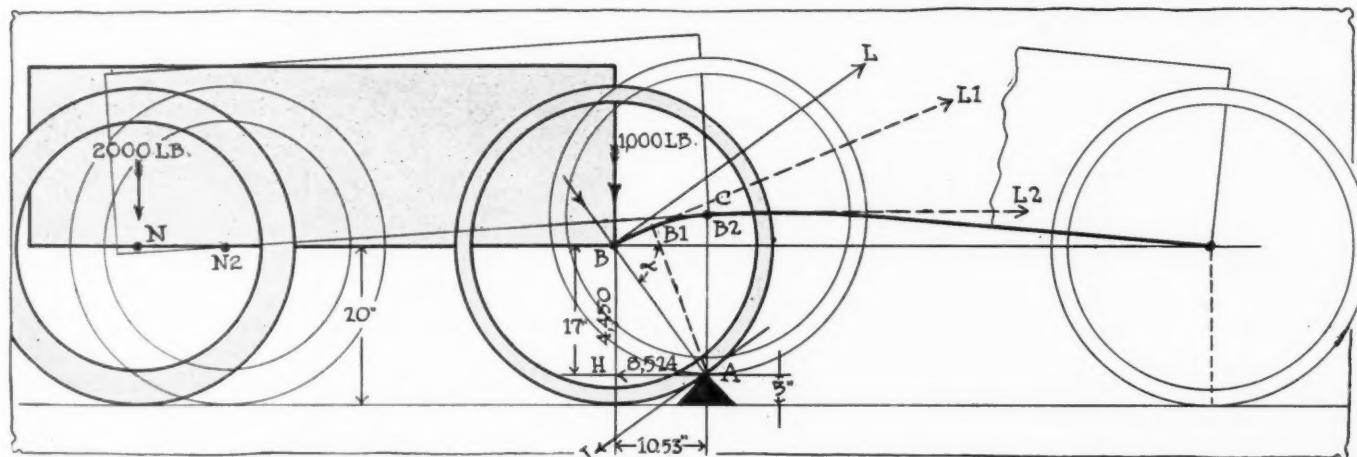


Fig. 6—Diagram indicating shock stresses and retardation occurring when front wheels of springless vehicle pass over a 3" ridge at 50 feet per second. Heavy curve shows course of axle before and after surmounting obstacle. Rear wheel curve similar but shorter

the measure as the axle describes the arc BC, finally reaching the value of 117,187 minus x (x being the energy lost), and that BA goes on decreasing in value toward zero. It is therefore the mean values which must be used for an estimate.

A Student's Question

(And, seeing that the retardation must be strongest at the beginning of this movement, a question is suggested as to whether the speed of the vehicle can really be reduced most in the beginning of the shock and afterwards can pick up. The answer must be that the horizontal speed of B is reduced most in the beginning by reason of the arc-movement, the tangent BL giving the direction, which veers from BL to CM, but that the vehicle as a whole cannot be retarded one moment and pick up the next, except under the influence of its motive power or possibly by means of energy stored momentarily in springs or tires. The opposite view would mean the creation of energy from nothing, since $\frac{1}{2} mv^2$ at any moment measures this energy. A possible function of

AJ, representing 17: 27.53 of its value, which is spent in overcoming friction at A, and another component running back in the direction of the wheelhub and equal to 10.53: 27.53 of the value of AH.

The modified value of BA is now obtained: The vertical component of BA is $22,325 \times 17 : 27.53 = \sim 759,050 : 55 = 13,801$ footpounds, and this divided by 3 makes 4,450 footpounds of vertical shock.

The horizontal component of BA is similarly found to be 8,524 footpounds, making the total of abstracted energy $4,450 + 8,524 = 12,974$ footpounds, and, on the same principle that was applied before, this gives the retardation from $v_1^2 = \frac{117,187 - 12,974}{3,000} \times 64$ and $v_1 = 8 \sqrt{34,737} = 8 \times 5.89 = 47.20$ feet per second.

Chance for Critics

There is seen to be a considerable divergence in the results of the two estimates, and this illustrates the tricky lapses for

which stress sheets in automobile construction have become notorious, usually rendering several trials by different persons necessary before errors in the estimated or omitted factors are brought to a working basis. For present purposes the figures of the second estimate may perhaps be used, however, as its errors will probably appear in the same proportions whether it is applied to a springless or a spring-suspended vehicle. Still there is evidently room for corrective ideas to develop the handiest and best method; so much more useful as the estimation of stresses, wherever exact calculation is impracticable, enlists new thought for the neglected fundamentals of spring action and has a tendency to clear up details not otherwise thought of. Under all circumstances no better figures can probably be devised for measuring the action of springs and tires, their advantages and their shortcomings, than those pertaining to the action of springless vehicles.

The Destructiveness

According to the figures of the second estimate, the retardation becomes 2.80 feet per second as soon as B has reached to the position of B₂, which is the same as C, and BL has been turned to the position of BL₂. It now becomes possible to figure somewhat on the destructiveness of the blow. The entire force of it (= 12,974 footpounds) minus 17 : 27.53 of 8,524 (being the tangential portion of the horizontal component—that which tears pieces out of solid-rubber tires when a sharp rocky edge is struck, springs being rather ineffectively arranged to reduce it), in all 12,974 — 5,269 = 7,705, is delivered against axle B during the time when the vehicle presses against the ridge and turns the wheel around A. The horizontal average speed here ranges from 50 to 47.20 feet per second, a mean of 48.60. From this, the time occupied in passing from B to C, a horizontal distance of 10.53 inches, is figured to be 0.01805 second, and, if a blow sustained in this

brief period works in practice as if it were instantaneous, the materials should be able to resist the whole force of it, the 7,705 footpounds. The blow may be examined with regard to the pressure on the axle and bearings by applying the formula

$$ks = \frac{1}{2} mv^2 \text{ or } k = \frac{m}{2s} v^2 \text{ or } s = \frac{m}{2k} v^2$$

in which k is pressure in pounds and s the space through which it is applied, this space being in the present instance the length of the arc BC, easily determined.

Considering the blow instantaneous and $s = 1$ foot, one has $k = 7,705$ pounds of pressure, directly on the bearings.

Slow Stress Transmission

But if the blow cannot be considered instantaneous, with reference to the nature of the material, especially the velocity in the molecular transmission of stresses, the pressure of 7,705 pounds must be considered as distributed decreasingly. If 4 periods make the action for each period equal to that of an instantaneous shock, in effect on the materials, the distribution would be somewhat like 5,000 pounds for the first fourth of curve BC, 2,000 for the second fourth, 600 for the third and 105 for the fourth. This means reducing maximum pressure on bearings nearly 50 per cent.

In the supposed case of an entirely unelastic vehicle, the question of the rapidity in transmission of stresses does of course not arise, but if wood is compared with steel as a wheel material—for heavy trucks, for example—and it is assumed that wood is the slower transmitter of stresses, it is evident that the subdivision of a shock stress extending over only such a short period as 0.01805 of a second may become of interest and may influence construction—as evidenced at present by the practically compulsory use of solid rubber tires with cast steel wheels.

(To be continued)

Vulcan Gearshift Stronger and Lighter

(Continued from page 1273)

the master switch snaps out instantly due to the action of the master switch spring O , thus breaking the electric circuit. The actual time of the engagement during which current is being drawn from the battery is less than 1-3 second.

Being in first speed, and desiring to proceed to another, another speed button upon the selector switch may be depressed at the convenience of the driver. Then, when it is desired to shift, the clutch is fully depressed as before, this action rotating the operating lever K and its shaft which carries the rocker arm I and its attached mechanism. As the first gear or whichever gear has been previously selected is in mesh the latch H is in engagement with the pawl G of the neutralizing mechanism, and as the operating lever and rocker arm I are rotated the latch H presses against the pawl G , causing both the neutralizing cams F to rotate toward the center, due to the fact that they are enmeshed through the teeth P .

On the central side of the shifter forks D , we have a boss and as the neutralizing cams F rotate toward the center, they press against the boss or whichever side the gear is in engagement. This mechanically pulls the shifter fork and the gear with which it is engaged back to neutral position—before the next shift can be made. As the gear reaches neutral position the end of the latch H strikes the knockout pin. This action releases the latch from engagement with the pawl G and as the operating lever K is moved ahead by the foot of the driver on the clutch pedal, the switch operating pawl L pulls against the switch stem, closing the circuit at the master switch, as before explained. The electric circuit is complete, the current flows from the battery through the

solenoid selected and the proper gear immediately jumps into engagement. This action is the same for all speeds.

Should it be desired to stop, the neutral button in the selector switch is pressed. This action throws any other button which may have been depressed out of contact, that is, it automatically raises any other button which may have been depressed previously.

When it is desired to stop, the clutch pedal is fully depressed, as before explained, and the operating lever K moves ahead. The neutralizing cams F pull on the boss on the shifter forks, the same as if a shift were to be made. The master switch M also will come into engagement as before. However, as the pressing of the neutral button has broken all contacts in the selector switch, a circuit is not made and the electric current does not flow. Therefore, as none of the magnet coils are energized, the gears remain in a neutral position.

Made in U. S. A. Exhibition March 6-13

NEW YORK CITY, Dec. 29—A "Made In The U. S. A. Industrial Exposition" will be held at the Grand Central Palace, this city, March 6 to 13. This exposition is designed to show American made and grown products in practically all branches of business.

The exposition committee includes a number of prominent automobile men, including George Pope, president of the National Assn. of Manufacturers; C. B. Warren, president of the Board of Commerce, Detroit; Lee Anderson, president, "Made in the U. S. Committee," Board of Commerce, Detroit, and A. L. Riker, vice-president, the Locomobile Company of America, Bridgeport, Conn.

Glass Radiator Betrays Poor Circulation

Flow Often Up, Instead of Down, Is Brought Out at S. A. E. Discussion—Uneven Distribution of Air Through Radiator a Cause—Humidity Has Large Bearing on Cooling

NEW YORK CITY, Dec. 29—At the regular monthly meeting of the Metropolitan Section of the Society of Automobile Engineers held tonight, the paper presented was, Radiators and the Cooling of the Car, by Howard Greer, Jr., chief engineer, McCord Mfg. Co. This same paper was presented before the Indianapolis branch of the S. A. E. in November and was published in the December 10 issue of THE AUTOMOBILE.

There were many interesting points brought out by the discussion which followed the paper. Mr. Greer stated that an excellent scheme for determining the vagaries of water circulation in a radiator was to construct a radiator of glass and then place very fine boxwood sawdust in the cooling water, this particular sawdust being selected because its specific gravity is about that of water, and therefore it is held in suspension instead of floating as would most kinds of sawdust. It is found that in some tubes the circulation is up when it should be down and that all sorts of currents are set up which hinder the circulation. By properly distributing the flow of air through the radiator and at the same time using baffles to give an even flow of water through all parts these troubles can be avoided.

Not only does the water circulate through the radiator in unexpected ways but also the flow of air through different parts of the radiator is not uniform. In fact there are many examples where the movement of air at certain points in the radiator has been out towards the front of the car instead of in. The difficulty is to supply a fan which will suck just as much air at its center as it does at the blade tips, in other words, produce a uniform flow. Then there is also the disadvantage that the fan covers a circular area, and the radiator is generally rectangular in shape. Uniformity in flow can be produced, however, by the proper design of the fan and by shrouding it in a metal cover. In this way the corners of the radiator are subjected to almost the same suction as portions directly in front of the fan. An objection raised against the shrouding of the fan was that in case the fan belt broke and it was necessary to run without the fan, the cooling would not be as effective because the natural circulation due to the motion of the car would be hindered by the shroud.

Mr. Greer stated that in the average car when a speed of 25 miles per hour was reached, the flow of air due to the motion of the car was about equal to that caused by the fan and that above this speed the fan was a hindrance rather than a help. Ludlow Clayden, a British engineer, bore out this statement by saying that several owners of Daimler-Knight machines have found that more power could be obtained, except at low speeds, by disconnecting the fan, although the reason more power was obtained might have been due to the fact that the motors ordinarily ran too cool.

That it is folly to split hairs over the efficiency of a fan and then not apply it to the radiator so that full advantage of its efficiency can be taken was also shown. The fan should cover as large a part of the radiator as possible and if it does not there is no great advantage in high efficiency.

More uniform cooling is possible where the fan is placed several inches from the radiator but there is not room in the ordinary car for this to be done. Overheating troubles can be helped and sometimes overcome by fitting a shroud. In one case the transfer of B.t.u.s was raised from 700 to 1,100 by so doing.

Disposal of Air

Another important point related to fan efficiency is the disposal of the air after it passes through the fan. Many makers take careful steps to bring a large amount of air through the radiator and yet make no provision for its disposal. The flow of air is often hindered by starting and lighting units placed in close proximity, by horns and piping. The mud pan is a tight fit under the flywheel and the dash comes down close to the top of the flywheel so that it often happens that there is little room for the air to make its way out.

Slightly better efficiency in the hands of the average owner is obtained by the thermo-siphon system, due mainly to the avoid-

ance of pump troubles. This system is heavier than the pump system and it is very necessary for uniform circulation that great care be taken in designing the water jackets, otherwise pockets will be formed in which water will stagnate until it becomes very hot or until a little steam is formed, when it will flow up to the radiator with a rush due to its much lower specific gravity.

Regarding the care of the radiator in Winter, it was stated that the best anti-freezing agents were denatured alcohol, glycerine or a mixture of the two; the plain alcohol is preferable. Acid-free glycerine is very expensive and hard to obtain.

Where too effective cooling for cold weather driving is obtained it is better to cover part of the radiator than remove the fan belt.

Humidity Important

An interesting fact was brought out regarding the overheating of some motor-driven sledges which were built for Antarctic exploration. It was found that they overheated badly when they were taken to their destination, although they ran cool during extensive tests in England. The explanation was that the Antarctic air lacked humidity, and that this factor must be taken into account in designing a cooling system. The addition of a small amount of moisture makes considerable difference in the specific heat of the atmosphere, and when this moisture is entirely absent, as it is near the Poles, the low temperature is not sufficient to offset the effect of the dry air. Similar experiences as to the effect of humidity have been found even in these latitudes.

The question of the practicability of a solderless radiator was brought up, the principle suggested being similar to that employed in steam boiler construction, but it was said that the objection was the cost—the public would not pay for such a radiator although successful experimental ones had been constructed both here and abroad.

In answer to the question as to the best way of mounting a radiator, Mr. Greer stated that the shell which houses the core should first be mounted in the chassis by the use of side brackets, trunnions or by bolting the bottom to a cross-member of the frame. Inside of this shell the core should be suspended by six or eight bolts held flexibly by spring washers.

Mr. Clayden brought up the question of mounting the radiator on the front of the crankcase and thus relieving it of the strains incident to chassis twisting and turning. Mr. Greer said that it is a question whether the motor vibrations, although smaller, were not worse than those due to the chassis, especially in view of the fact that the motor vibrations were regular. Unless the radiator is specially built to withstand these small strains it would soon be shaken to pieces. This method of suspension has found favor on two or three Italian cars.

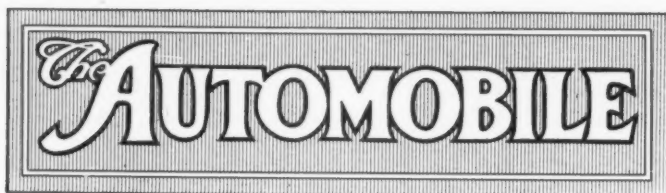
In answer to the question as to the most desirable number of fan blades the speaker said that above 16 inches diameter six blades were as a rule best, but below this diameter four blades were preferable. However, one of the most efficient fans was a two-bladed French design.

NEW YORK CITY, Dec. 28—The Maxwell Motor Co., Detroit, Mich., recently issued a 416-page Master Price Book for the use of dealers and owners of all the old models. The book gives numbers, names and prices of parts, instructions on ordering, etc., for 164 different models. It is divided into sections, and each section covers all the models of one make of car. For example, the Stoddard-Dayton section is printed on yellow stock, the Brush models on pink paper and the Columbia section is made up of buff stock.

DETROIT, MICH., Dec. 28—Charles E. Van Horne has resigned his position of manager of the commercial car department with the Studebaker Corporation and has been succeeded by Henry Myers, manager of the Studebaker branch in Boston, Mass.; successor of Mr. Myers in Boston is George N. Jordan, traveling sales representative of the Studebaker Corporation in New England.

DETROIT, MICH., Dec. 29—Paul H. Bruske, who has been publicity manager of the Studebaker Corp., has resigned and will become manager of the racing team of the Maxwell Motor Co., beginning January 1.

DETROIT, MICH., Dec. 29—Claude A. George, for many years with the export department of the Willys-Overland Co., sailed last week for London as export sales manager of the Signal Motor Truck Co., and of the O. K. light delivery truck company.



PUBLISHED WEEKLY

Vol. XXXI

Thursday, December 31, 1914

No. 27

THE CLASS JOURNAL COMPANY

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 Member of the Audit Bureau of Circulations.
 The Automobile is a consolidation of The Automobile (monthly) and the Motor
 Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903,
 and the Automobile Magazine (monthly), July, 1907.

Little Truck Show

IT is now 2 years since we have had the motor trucks with us at an annual show, but the arranging for a "commercial vehicle division" in the present show, where truck makers can establish temporary headquarters and meet dealers, suggests how many truck makers have missed the annual show, and how meeting with out-of-town dealers has been practically cut off. The truck industry today needs more dealers in many quarters; and with not a few dealers there has been growing the feeling that the truck business is harder than the passenger car field, requires more financing and is more susceptible to ups and downs in close coincidence with business conditions, a situation which has never been so pronounced in the passenger car field.

This combination of influences has already impressed on many truck makers the necessity of keeping more in the public eye, and incidentally more in the dealers' eyes. Before another year it will be astonishing if truck makers do not unite in some form of national demonstration, which will serve to bring their wares into the public eye in a forceful manner. A huge national truck show, accompanied by some form of outside demonstration, would succeed in this work. If not this, then, a great national demonstration or trial of some nature would serve the same mission. One thing is certain, namely, that

any growing industry, such as the motor truck one, cannot afford to keep its light under a bushel. There is too much missionary work to be done for that. There are too many doubting Thomases to be convinced. United effort is needed. Instead of too much internal rivalry among makers, which saps activity, a more concentrated attack is needed on horse transportation. The field of possibility of the motor truck is so extensive that individual effort is not enough; the united attack of the industry is needed.

The Eight

NEW YORK'S fifteenth annual automobile show, which opens Saturday of this week, will have more wonders for the automobilist than several of the recent shows, and instead of the show losing interest as years go by the interest is annually increasing. One year ago few even vaguely imagined that stock eight-cylinder cars would be on the market in 1915, but already we have three different makes, and by the opening of the Chicago show one or two more may be announced, if the present pace is kept up. The eight-cylinder has proven a very easy manufacturing job, in fact, it is very closely associated with the four-cylinder, so that beginning its manufacture is not accompanied with those problems that accompanied the development of stock six-cylinder motors.

Up to this time the eight has not been taken up so actively by those concerns that have been building sixes, all announcements to date coming from those who have marketed only fours heretofore. This aspect of the eight would seem to indicate a possible dropping off of fours, but the opposite may prove the rule, because it will not be a difficult manufacturing job to build an eight and use one of the cylinder blocks for a small four. Viewed in this light it will not be surprising to see renewed activity in the small four, a movement which would without doubt point to the overcrowding of this market, which during the past fall has been one of the most active in the automobile field.

Motor Values

THAT we spend our years as a tale that is told, is almost demonstrated in the return this season to valve-in-the-head motors, a type of construction which is rapidly gaining in four-cylinder and six-cylinder construction, but which is not particularly adaptable to eight-cylinder design in that it makes too wide a motor.

Years ago the valve-in-the-head design demonstrated its greater power efficiency due to smaller combustion space and lower heat losses through the combustion chamber walls. In those days the engineer had not mastered the art of reducing motor noises, and the valve mechanism being on the cylinder head close to the top of the bonnet these noises were accentuated, the bonnet became a sounding board, and with the advent of quieter motors the valve-in-the-head design lost prestige.

Its revival came with the greater use of it in racing cars in Europe during the past 5 years. Europe was constantly reducing piston displacement and the only available means of increasing power seemed to lie in increasing the thermal efficiencies made possible by the head valve location. Thanks to the development of racing the problem of practically enclosing the valve mechanism was soon mastered, so that noise was eliminated. The difficulties of lubricating parts that previously were exposed to the dust were overcome, and by eliminating dirt and insuring lubrication, the previous problem of keeping the valve adjustments constant and quiet were largely overcome. Each year now sees more valve-in-the-head motors, and this movement will unquestionably continue, if not quite side tracked by the eight-cylinder.

The 1915 Will

TODAY we stand face to face with the opening of another year, another cycle of existence. The new year will have many surprises for us. Try as we can to decipher its hidden secrets, our final efforts end in failure. Too often we live too much in the future, too often our vague interpretations of coming events lead us to largely nullify our present efforts.

"Act, act in the living present" is good advice.

The future can best be taken advantage of by a steady consistent performance each day. It is unwise to frame all our activities of today by our estimate of the future. Were this so not a few concerns might decide to close shop until the war clouds have rolled away, but what a disorganized condition would that house find itself in, if it followed such a policy!

"Seedtime and harvest, summer and winter" have been with us since that Divine promise of their continuance was given, and this is a message to all, that our cycles of activities must be kept up, and that while exigencies may temporarily stampede business, and while war may upset temporarily many financial arrangements, still we must go forth to the day's work, with a firm heart, believing that our duty is to will that matters improve. We must go forth into the new year, not weighed down with pessimism, but buoyed up with that promise of centuries ago that business will continue, and that we as individuals owe a duty in sowing optimism rather than doubt.

Accessories Active

EACH year sees the accessory maker expanding his field, and becoming more and more a dominating influence in a greater number of cars. Thus for 1915 we find more makes of cars using motors built by concerns that specialize in building motors. The same is true of gearsets, of axles, and of steering gears. The specialty maker has been doing valiant service in the development of his product, and that he is quite in advance in various lines is well demonstrated by the speed with which eight-cylinder motors have been developed and perfected for marketing to the trade.

Some of the most interesting features of the show

will be found in the accessory department, where over 250 different makers will exhibit. Novelty will be found in the older lines as well as the new concern brought into existence because of some recently acquired patent. Our magneto makers have progressed very much during the year, and although the magneto was considered a well-perfected device, yet the work of the past year has been along lines of simplification and efficiency. With them there has not been a feeling that the product is good enough, but rather one of keeping steadily improving.

Carbureter activity has been greatly stimulated during the past fall by the resurrection of fuel tests, together with the influx of smaller motors and the very general discussion on greater efficiency. New models have been brought out by old makers and new principles incorporated in not a few of them. The general movement to block casting has stimulated the horizontal type, which bolts directly to the casting, eliminating the manifold, and this type is coming rapidly.

Cord tires have made very material progress, and today more of the manufacturers are convinced of the greater mileage of these, the greater speeds possible with them, the greater fuel economy that accompanies their use, and the better hold on the road that they possess. Next year will doubtless see a wide increase in their use.

The adoption of vacuum-gravity fuel feed has been one of the accessory activities of the year, and its quick adoption has in many instances been due to the public efficiency tests that have been carried out.

1915 Specifications

THE AUTOMOBILE presents in this issue its annual specification tables of the leading passenger cars for 1915, these containing the details of approximately 115 different makes of cars. All, unfortunately, are not included due to bringing out later models, some of which will not be announced before the opening of the show.

These specifications give the most accurate clue to trends in design, when compared with those appearing on previous years. The many facts regarding American cars have been collected annually for the past 5 years and in this issue it has been possible to give trends extending over that period of time. It is only when we glance over a period of years that the exact current of the industry can be seen. From year to year detail trends not infrequently zig-zag, but these minor fluctuations are lost sight of in the general direction of the chart curve covering 5 or more years. Thus we find that wheelbases may shorten a fraction of an inch one year, but this is immaterial when the general increase of 4 other years is noticed; and by comparing the advent of the six-cylinder movement with the trends in wheelbase it can be regularly noticed how the invasion of the six into each price classification has resulted in 5 or 6 inches being added to the wheelbase. Comparisons of this nature over 5 years have most valuable lessons; in short, in them lies the great clue to the possible paths of tomorrow.

Handley Forms \$1,000,000 Company

Mutual Motors Co. Plans To Manufacture Complete Cars for Marion and Imperial

INDIANAPOLIS, IND., Dec. 30.—By the incorporation of the Mutual Motors Co. with \$1,000,000 capital J. I. Handley, president and owner of the Marion Motor Co., re-enters the automobile industry as president and general manager of the Mutual Motors Co., which will be devoted entirely to the manufacture of automobiles in Jackson, Mich., where complete cars will be built for the Marion Motors Co., of Indianapolis, and also for the Imperial Automobile Co., of Jackson, Mich. The Mutual Motors Co. is to be solely a manufacturing organization and will in no wise be interested in the sale and distribution of either the Marion or Imperial cars which it will manufacture, but rather the Marion and Imperial companies will remain independent and complete within themselves for the sale and distribution of their respective cars.

The Mutual Motors Co. has already secured a plant consisting of a two-story building, 900 by 440 feet.

Of the \$1,000,000 authorized, Mr. Handley says that \$600,000 has already been contracted for. The directors of the newly formed Mutual Motors Co. are: B. M. DeLamater, president of the People's National Bank of Jackson, also president of the Jackson Cushion Spring Co.; W. S. Kessler, president Albion Malleable Iron Co., Albion, Mich.; W. R. Smith, treasurer and general manager of the Jackson Cushion Spring Co.; T. A. Campbell, treasurer and general manager of the Imperial Automobile Co.; J. I. Handley, president and owner of the Marion Motor Co.

Other prominent men who have already procured a stock interest in the new company are: A. Hirscheimer, president of the LaCrosse Plow Co. and the Batavian National Bank of LaCrosse; H. J. Hirscheimer, vice-president LaCrosse Implement Co., Minneapolis; B. F. Hamey, general manager LaCrosse Implement Co.; Winthrop Withington, president Sparks-Withington Co., Jackson, vice-president and general manager American Fork & Hoe Co.; H. S. Reynolds, vice-president People's National Bank, Jackson; T. E. Barkworth, ex-president Michigan Bar Assn.; F. E. Davis, general manager automobile department LaCrosse Plow Co.; George Campbell, sales manager Imperial Automobile Co.

Allegan Gets Blood Bros. Plant

ALLEGAN, MICH., Dec. 26.—Efforts to have the Blood Bros. Machine Co., remove from Kalamazoo where they are now located to this city have ended successfully and contracts were signed to that effect. The amount of \$50,000 which the Blood company asked that be raised by Allegan people has been over-subscribed, it is said. Just when the concern will locate here has not been ascertained, but when located here the company will arrange to bring out a small four-cylinder roadster and touring car next June or July.

Krit Car and Sales Cos. File Petition

DETROIT, MICH., Dec. 28.—A voluntary petition in bankruptcy was filed today by the Krit Motor Car Co. and by the Krit Sales Co. The action was agreed upon at a meeting of the board of directors, December 21, which stated that the company is unable to pay its debts in full.

The liabilities of the Krit Motor Car Co., total \$881,088.47; the assets total \$622,533.27. Liabilities of the Krit Sales Co. are \$234,305.63; assets total \$256,814.70. Among the liabilities is \$28,657.13 in deposits from nearly 175 dealers.

The Krit Motor Car Co. was organized in September, 1909, with a capital stock of \$100,000, which was later increased to \$500,000. Two years ago the company was in financial trouble but was reorganized. Last February the Krit Sales Co. was organized with a capital of \$100,000 for the purpose of enabling the Krit Motor Car Co. to obtain materials and parts for car manufacture as well as meet its pay-roll. Several officers of the car company are also among those of the sales organization. Referee in Bankruptcy, Joslyn, has called a meeting of the creditors for January 18, to appoint a trustee.

Automobile Securities Quotations

NEW YORK CITY, Dec. 29.—The stock market showed a slightly weaker tone during the past week than was the case the week before, most of the securities experiencing declines of a point or so, though a few showed gains of about the same magnitude. The only large increase was that by Ajax-Grieb common, which gained 10 points. The preferred dropped 1 point. Firestone common lost 2 points, General Motors, Goodrich, Kelly-Springfield and Maxwell were slightly off, as were Studebaker and U. S. Rubber, as compared with last week's figures. Goodyear common and preferred were 2 points higher, while Willys-Overland gained 1 point on the common and 2 points on the preferred.

| | 1913 | | 1914 | |
|---|------|-------|------|-------|
| | Bid | Asked | Bid | Asked |
| Ajax-Grieb Rubber Co. com..... | 195 | 210 | 260 | 310 |
| Ajax-Grieb Rubber Co. pfd..... | 98 | 100 | 99 | 105 |
| Aluminum Castings pfd..... | 97 | 100 | 95 | 100 |
| J. I. Case pfd..... | .. | .. | .. | .. |
| Chalmers Motor Company com..... | .. | 91 | .. | 88 |
| Chalmers Motor Company pfd..... | 90 | 93 | .. | 92½ |
| Electric Storage Battery Co..... | .. | .. | .. | .. |
| Firestone Tire & Rubber Co. com..... | 242 | 250 | 348 | 354 |
| Firestone Tire & Rubber Co. pfd..... | 103 | 104 | 110 | 112 |
| Garford Company pfd..... | 80 | 90 | .. | .. |
| General Motors Company com..... | 36½ | 38 | 76½ | 77½ |
| General Motors Company pfd..... | 76 | 78 | 89 | 91 |
| B. F. Goodrich Company com..... | 22½ | 23½ | 23 | 25 |
| B. F. Goodrich Company pfd..... | 78 | 79 | 91 | 95 |
| Goodyear Tire & Rubber Company com..... | 190 | 195 | 190 | 192 |
| Goodyear Tire & Rubber Company pfd..... | 92 | 94 | 102 | 104 |
| Gray & Davis, Inc., pfd..... | 94 | 101 | .. | .. |
| International Motor Co. com..... | .. | 5 | .. | .. |
| International Motor Co. pfd..... | .. | 14 | .. | .. |
| Kelly-Springfield Tire Company com..... | .. | .. | 65 | 68 |
| Kelly-Springfield Tire Company 1st pfd..... | .. | .. | 75 | 79 |
| Kelly-Springfield Tire Company 2d pfd..... | .. | .. | 93 | 97 |
| Maxwell Motor Company com..... | 3 | 3½ | 14 | 15 |
| Maxwell Motor Company 1st pfd..... | 21½ | 22 | 41½ | 43 |
| Maxwell Motor Company 2d pfd..... | 7 | 7½ | 16 | 17 |
| Miller Rubber Company..... | 115 | 120 | 160 | .. |
| New Departure Mfg. Company com..... | 135 | 145 | .. | .. |
| New Departure Mfg. Company pfd..... | 101 | 102 | .. | .. |
| Packard Motor Car Company com..... | .. | .. | .. | 100 |
| Packard Motor Car Company pfd..... | 91 | 95 | 90 | .. |
| Peerless Motor Car Company com..... | 15 | 25 | 15 | 20 |
| Peerless Motor Car Company pfd..... | 75 | 80 | .. | 55 |
| Pope Manufacturing Company com..... | 1 | 2 | .. | .. |
| Pope Manufacturing Company pfd..... | 7 | 12 | .. | .. |
| Portage Rubber Company com..... | .. | 40 | 25 | 30 |
| Portage Rubber Company pfd..... | .. | 90 | 80 | 85 |
| *Reo Motor Truck Company..... | 6½ | .. | 10½ | 11½ |
| *Reo Motor Car Company..... | 14½ | .. | 21½ | 23 |
| Splittorf Electric Company pfd..... | 40 | 45 | .. | .. |
| Stewart-Warner Speed, Corp. com..... | 47 | 51 | 50 | 52 |
| Stewart-Warner Speed, Corp. pfd..... | 94 | 97 | 99 | 101 |
| Studebaker Corporation com..... | 18 | 18½ | 30¾ | 32½ |
| Studebaker Corporation pfd..... | 68½ | 70 | 85 | 87 |
| Swinehart Tire & Rubber Company..... | 68 | 71 | 69 | 70 |
| Texas Company..... | .. | .. | 122 | 129 |
| U. S. Rubber Company com..... | 56 | 57 | 51 | 53 |
| U. S. Rubber Company pfd..... | 100½ | 101 | 100 | 102 |
| Vacuum Oil Company..... | 195 | 198 | 199 | 202 |
| White Company pfd..... | 105 | 110 | 108 | 110 |
| Willys-Overland Company com..... | 59 | 62 | 84 | 85½ |
| Willys-Overland Company pfd..... | 80 | 85 | 92 | 94 |
| Rubber Goods Mfg. Company pfd..... | 104 | 112 | .. | .. |

*Par value \$10; all others \$100 par value. †Ex dividend.

Maxwell and Case Stocks Listed on Exchange

NEW YORK CITY, Dec. 24.—The governing committee of the Stock Exchange has approved the listing applications of the following companies:

Maxwell Motor Co., Inc., \$9,791,800 stock trust certificates for 7 per cent. cumulative first preferred stock, \$7,457,900 stock trust certificates for 6 per cent. non-cumulative second preferred stock and \$9,586,200 stock trust certificates for common stock.

The J. I. Case Threshing Machine Co., \$6,816,700 extended stock trust certificates for preferred stock to 1918 "stamped."

Chandler Common Pays 17½% in 1914

CLEVELAND, O., Dec. 24.—The Chandler Motor Car Co. has declared the regular quarterly dividend of 13-4 per cent. on its preferred and an extra dividend of 21-2 per cent. on its common stock. This makes 171-2 per cent. paid on the common stock in the calendar year 1914, and the company's surplus after the 1914 dividends is equivalent to more than the \$225,000 par value of all common stock.

LONDON, ENGLAND, Dec. 26.—Plans have been made for a limited reopening of the London stock exchange with no speculative business at the outset. A committee has been appointed to fix maximum prices in other securities outside the gilt-edge group, should occasion arise. Every one who wishes to be member of exchange must be a British subject.

Market Reports for the Week

NEW YORK CITY, Dec. 30—The usual changes occurred in the market reports this week. Electrolytic copper was lower, closing at \$0.12 5-8 a pound. The tone of this market is weak. According to reports there will be a decrease of 10,000 tons in output in Russia and Spain in 1914. Tin fluctuated throughout the week and closed with no change. This metal was weaker this week with small sales. Lead was quiet and unchanged. Prices in the oils and lubricants markets continue steady with a fair demand. Trading in crude rubber continued quiet. Fine Up-River Para came down \$0.01, closing at \$0.75. The offerings in this rubber were light and the prices were in all instances apparently well maintained. Supplies of rubber in New York City continue light.

| Material | Wed. | Thurs. | Sat. | Mon. | Tues. | Week's Change |
|------------------------------|-------|--------|-------|-------|-------|---------------|
| Antimony | .12½ | .12½ | .12½ | .12½ | .12½ | ..... |
| Beams & Channels, 100 lbs. | 1.21 | 1.21 | 1.21 | 1.21 | 1.21 | ..... |
| Bessemer Steel, ton | 18.50 | 18.50 | 18.50 | 18.50 | 18.50 | ..... |
| Copper, Elec., lb. | .13½ | .13½ | .12½ | .12½ | .12½ | -.00½ |
| Copper, Lake, lb. | .13 | .13 | .13½ | .13½ | .13½ | +.00½ |
| Cottonseed Oil, bbl. | 5.64 | 5.75 | 5.75 | 5.75 | 5.79 | +.15 |
| Cyanide Potash, lb. | .21 | .21 | .21 | .21 | .21 | ..... |
| Fish Oil, Menhaden, Brown. | .38 | .38 | .38 | .38 | .38 | ..... |
| Gasoline, Auto, bbl. | .13 | .13 | .13 | .13 | .13 | ..... |
| Lard Oil, prime | .90 | .90 | .90 | .90 | .90 | ..... |
| Lead, 100 lbs. | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | ..... |
| Linseed Oil | .50 | .50 | .50 | .50 | .50 | ..... |
| Open-Hearth Steel, ton | 18.50 | 18.50 | 18.50 | 18.50 | 18.50 | ..... |
| Petroleum bbl., Kans., crude | .55 | .55 | .55 | .55 | .55 | ..... |
| Petroleum, bbl., Pa., crude | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | ..... |
| Rapeseed Oil, refined | .71 | .71 | .71 | .71 | .71 | ..... |
| Rubber, Fine Up-River, Para | .76 | .76 | .76 | .76 | .75 | -.01 |
| Silk, raw, Ital. | 3.90 | 3.90 | 3.90 | 3.90 | 3.90 | ..... |
| Silk, raw, Japan | 3.28 | 3.28 | 3.28 | 3.32½ | 3.25 | -.03 |
| Sulphuric Acid, 60 Baume | .90 | .90 | .90 | .90 | .90 | ..... |
| Tin, 100 lb. | 33.25 | 33.50 | 33.63 | 33.50 | 33.25 | ..... |
| Tire Scrap | .05 | .04½ | .05 | .05 | .05 | ..... |

To Sell Lozier Property February 1

DETROIT, MICH., Dec. 29—*Special Telegram*—At the first meeting of creditors of the Lozier Motor Co. since the concern was declared bankrupt, the Detroit Trust Co., which has been acting as receiver, was elected trustee. Referee in Bankruptcy Lee E. Joslyn ordered that the property of the Lozier company be offered for sale, either as a whole or parcel about February 1 subject to confirmation by the court. A deposit of 10 per cent. but not more than \$25,000 must be made by a bidder, and the bids are subject to the acceptance or rejection of the court.

Bearings Co. of America Succeeds Bretz Interests

NEW YORK CITY, Dec. 29—The Bearings Co. of America has been formed to succeed the J. S. Bretz Co., the Fichtel & Sachs Co. and the Star Ball Retainer Co., both of Lancaster, Pa. All three of the old companies were dissolved during 1914, the idea being to concentrate the entire manufacturing, warehousing, the shipping and service departments at Lancaster, and the entire sales department at 250 West Fifty-fourth street, this city.

No change has been made in the personnel. The company will continue to sell, produce and import F. & S. annular ball bearings, ball thrust bearings, Star ball retainers, German steel balls and Bowden wire mechanism.

Profit-Sharing by Detroit Companies

DETROIT, Mich., Dec. 28—The King Motor Car Co. will distribute at least 10 per cent. of its total profits for the year 1914 among all its employees in January. About 200 men and women will share in the profits, as was the case in January, 1914, when 10 per cent. of the profits made in 1913 were given all those connected with the company but who are not stockholders. The share of each employee is determined according to his annual salary.

Following a custom which was inaugurated several years ago, the Ford Motor Co. has distributed a part of its annual profits in the way of a Christmas present among 200 to 300 heads of departments, general foremen, factory heads, old employees not only with the plant here in Detroit, but with the various assembling plants, branches and foreign branches all over the world. The total amount is not disclosed, but it represented the output of about one-half the number of cars made in one day at the Ford plant, which would be from 800 to 1,000 cars.

The Federal Motor Truck Co. gave all its employees, 150 to 200, a Christmas present in the shape of a deposit in a savings bank, representing 10 per cent. of their wages for the year. The idea was rather novel and seemed to have been more appreciated by the employees than if checks or currency would have been given. The reason of the Federal company in having the money placed to the credit of each employee was to instill further the saving habit among them.

Rubber Industry Protests Embargo

Daily Cost to Manufacturing

Interests Totals \$250,000—

No Improvement in Situation

NEW YORK CITY, Dec. 26—Representatives of large rubber manufacturing interests who have been conferring with representatives of the State Department in Washington and of the British Embassy with regard to the embargo which the British government placed upon shipments of crude rubber coming from Ceylon and the Federated Malay States in November last, state that they are unable to report substantial progress. The matter has been in negotiation with the authorities in Washington, with the British Consul in this city and with the British government in London for more than a month, but the latter, while not willing to raise the embargo entirely, is ready to permit rubber from British colonies and London to be shipped to America if our manufacturers will give satisfactory guarantees that neither raw material nor manufactured articles will be sent to Germany or Austria.

F. A. Seiberling, president of the Goodyear Tire & Rubber Co., Akron, O., on December 28 visited Washington and made representations to the United States government and the British embassy regarding Great Britain's action in placing tires and other rubber products on the contraband list. Mr. Seiberling saw President Wilson, in company with Senator Pomerene and Ex-Senator Charles Dick, of Ohio. On the same date the U. S. government forwarded to the British government a memorandum which, while not so officially designated, is in the nature of a protest against Great Britain's embargo and other restrictions upon American commerce.

Mr. Seiberling and B. G. Work, president of the B. F. Goodrich Co., Akron, O., and representing the Rubber Club of America, will go to London to lay a protest before the British government.

According to certain authorities, this embargo is costing the rubber industry about \$250,000 a day, and has sent the price of plantation up to 90 cents a pound, against the normal price of 45 to 55 cents. Roughly speaking, this means the cutting off of over 50 per cent. of the normal supplies of crude rubber required by the industry in this country. Fine, up-river Para went up from 60 cents to 76 cents.

As a result of the war German chemists have been confronted with a number of important technical problems, chief among which are those of furnishing suitable substitutes for gasoline and rubber. No trouble has been found in finding a suitable substitute for gasoline, as benzol and alcohol, the former being a by-product of the manufacture of coke, the production amounting to about 160,000 tons a year. About 100,000 tons are available for fuel purposes. There is no shortage of alcohol for motor purposes.

But the problems arising from the shortage of rubber are much more difficult than those arising from the fuel situation. The importation of caoutchouc, India rubber, has been interrupted, and the synthetic production of this material was neglected before the war. Several satisfactory substitutes have been evolved by combining acetone and benzol products with caoutchouc. A certain supply of caoutchouc can be maintained by the manufacture of regenerated caoutchouc from scrap rubber.

The rubber problem in the United States has caused a syndicate in Akron to enter into contract with a number of ranch owners of Texas for the right to grow and gather the guayule shrub upon their renting several million acres of land. It is said to be the purpose of the syndicate to ship the guayule shrub to Akron where it will be manufactured into crude rubber. Marathon, Tex., has the only factory making crude rubber in the United States.

McGraw Tire Co. Offers \$500,000 Stock

EAST PALESTINE, O., Dec. 26—The McGraw Tire & Rubber Co., through the Maynard H. Murch Co., Cleveland, O., has offered \$500,000 in 7 per cent. preferred stock.

Net earnings of the company for the fiscal year ended November 30, 1914, were \$594,136. This is about seventeen times the preferred dividend charges. In 1913 net earnings amounted to \$285,558. The company has net tangible assets, exclusive of good will, patents, etc., of \$1,353,670. It is capitalized at \$500,000 common and \$500,000 preferred.

Show to Open with 360 Exhibits

50,000 Square Feet More Space—Additional Exhibits Expected—500 Cars and Chassis on Display

NEW YORK CITY, Dec. 28—The fifteenth annual automobile show will open on Saturday, January 2, at 2 o'clock in the Grand Central Palace, this city. There will be 360 exhibits of automobiles, motorcycles and accessories distributed on the four lower floors. The exhibition will last 1 week, opening each day at 10 a. m. and closing at 10.30 p. m.

The first two floors will hold the automobile exhibits, with the six electric car exhibitors grouped on the second floor. The accessory exhibitors will be on floors three and four exclusively.

The National Automobile Chamber of Commerce anticipated the largest automobile show this city has ever held by enlarging the exhibit space by 50,000 additional square feet, as compared with a year ago, making the grand total of 150,000 square feet. There are, approximately, seventy-six makers of gasoline cars, there may be two or three more by opening hour; six makes of electrics; thirteen motorcycle makers, and about 284 makers of accessories and component parts for cars. It is certain that the above number of exhibitors will be materially increased at the eleventh hour, so that the total of 352 exhibitors at the show in 1914 will be equalled if not eclipsed. Last year a total of 492 different cars and chassis were displayed and it is expected that this figure will be slightly exceeded. Perhaps more than 500 vehicles will be on display.

Of the seventy-six makes of cars, fifty-nine are members of the N. A. C. C., Inc., and seventeen are outsiders, these non-members to date including Crawford, Davis, Durant, Enger, Grant, Herff-Brooks, Lexington-Howard, L. P. C., Owen, Patterson, Pilot, Remington, Scripps-Booth, Twombly, Trumbull, Malcolm and Gadabout. Not all N. A. C. C. members are exhibiting, several familiar faces of past years being missing, among these being noted Abbott, Austin, Great Western, Lozier, Marion, Pope-Hartford, Pullman, S. G. V., Speedwell and Staver, some of which have ceased manufacturing operations during the past year and others who are simply not exhibiting.

It is estimated by Manager S. A. Miles of the show that \$1,000,000 will be spent in this city by those attending the show. According to his estimates, over 20,000 out-of-town visitors will attend, 95 per cent. of whom will stop at hotels.

Axle Makers Unite Against Kardo Co.

BOSTON, MASS., Dec. 30—That a combination among axle makers to fight the suit recently started by the Kardo Co., against the Salisbury Wheel & Axle Co., Jamestown, N. Y., is in process of formation was practically verified today. Frederick P. Fish, of the law firm of Fish, Richardson, Herick & Neave, of this city, are preparing the case and conducting the investigation at the present time. This is the same firm that has undertaken the case for the National Automobile Chamber of Commerce, which is handling the suit of the Studebaker Co., against the Kardo interests.

Word comes from Detroit that the majority of the large axle manufacturers will unite to protect one another in this patent litigation, and although details of the work are not available, it is understood H. W. Alden, engineer of the Timken-Detroit Axle Co., is the moving spirit of the enterprise and that the majority of the axle manufacturers have agreed to unite in fighting the patents.

The Kardo patents refer to floating axle constructions and also certain front axle constructions in which the vertical pivot in the axle ends bears a relationship with the point on the ground on which the tire rests.

C. of C. Named in Windshield Suit

CLEVELAND, O., Dec. 26—Action was brought in the United States District Court Thursday, December 24, making the National Automobile Chamber of Commerce co-defendant in the suit for infringement brought by William B. Hanlon,

James R. Wardrop and the Anderson Electric Car Co. against the Rauch & Lang Carriage Co.

Legal notice is served against the National Automobile Chamber of Commerce, its patent committee, officers and directors, excepting the Anderson Electric Car Co. It names Windsor White, of the White company, as one of the vice-presidents.

The complaint alleges that on February 16, 1914, they filed action against the Rauch & Lang Carriage Co. for alleged infringement of patent on shields for car windows issued to William B. Hanlon December 2, 1913.

The feature of the patent in suit is that it uses two panes of glass, forming the upper part of the windshield, one pane being in front of the other. The outer one can be swung outward and forward, forming a protector against snow and rain and affording a clear vision, while the inner glass remains vertical, making a complete windshield in conjunction with the single pane which constitutes the lower half. Both the panes in the upper portion are movable.

Ford Wins Suit to Protect Name

CHICAGO, ILL., Dec. 29—A final injunction has been issued by Judge Landis against Fred Buck, in business as the Barry Sales Co., in the suit brought by the Ford Motor Co. restraining the defendants from using the Ford name and trade mark in any way and from representing that any relation exists between them and the Detroit factory. The Ford company complained that the defendants had a Ford sign and trade mark on their building when they had no right to do so, the company not being a Ford dealer but buying cars from other dealers. The case was in the U. S. district court for the Northern district of Illinois, Eastern section.

Preliminary Injunction Denied in Horn Suit

NEW YORK CITY, Dec. 29—Judge Hand has denied the motion for a preliminary injunction made by Gottfried Piel and the G. Piel Co. in the suit against the Stewart-Warner Speedometer Corp. of New York and the Stewart-Warner Speedometer Corp. of Virginia involving alleged infringement of the Long hand horn patent No. 1,090,080. Judge Hand states, in his opinion:

"Whatever may be said of the patentability of the device, as disclosed, clearly it cannot be thought to cover the defendant's device if the claims are to remain valid."

Ritz Cycle Car Co. Sues for \$50,000

NEW YORK CITY Dec. 28—The Ritz Cycle Car Co., of this city, has filed suit for \$50,000 damages against the Driggs-Seabury Ordnance Corp., Sharon, Pa., alleging failure to carry out its part in a contract calling for the manufacture and delivery of 500 small cars to be known as the Ritz at the rate of 100 cars per month during June, July, August, September and October of this year. The Ritz company, in its bill of complaint, charges that the contract was entered into on April 8 and alleges that it deposited with the Driggs-Seabury corporation \$5,000 in cash and two promissory notes for \$2,500 each, payable 3 and 4 months, respectively, after the date of the contract. This money, it states, was to cover the cost of dies, jigs, tools, fixtures, etc., required for the manufacture of the Ritz cars.

The Ritz company alleges that the Driggs-Seabury corporation has furnished and is about to furnish cars called the Ritz, and made from the drawings, plans, etc., prepared by the Ritz company, to persons with whom the latter had contracts, and, moreover, that the price of these cars is lower than that which the Ritz company intended to ask. The concern claims damages to the extent of \$50,000 and requests an accounting. It also asks for both preliminary and final injunctions against the Driggs-Seabury corporation using the name Ritz or making cars from the drawings, plans, etc., the Ritz company claims to have prepared. The bill of complaint concludes with the request that the Driggs-Seabury corporation bear the costs of the suit, which is brought in the U. S. district court for the Southern district of New York.

Prest-O-Lite Co. Wins Patent Injunction

LANSING, MICH., Dec. 21—An injunction against Roy O. Perry, doing business under the name of Haight Auto-Lite Co., South Washington avenue, has been granted to the Prest-O-Lite Co., Indianapolis, Ind., by Judge Tuttle of the United States District Court of Detroit. It is held that the local company infringes the patents of the Indianapolis concern.

Canadian Ford Profits \$2,022,496

Surplus of \$1,804,846 and \$1,257,032 in
Cash on Hand and in Bank—
25,000 Cars Made

DETROIT, MICH., Dec. 24—During the fiscal year ending October 31, 1914, the Ford Motor Co. of Canada, Ltd., made a total profit of \$2,022,496.06, or over 200 per cent. on its capital stock, which is \$1,000,000. At the same date the concern has \$1,804,846.30 surplus to its credit, and its account of cash on hand and in the bank showed a total of \$1,257,032.35.

Thus ended the most successful business year the Canadian Ford company has had since the plant was started in Ford City just 10 years ago last August. The prospects for 1915 are declared to be very good, notwithstanding the war and the fact that a large percentage of the annual output is shipped to foreign countries.

The balance sheet shows the total value of the assets at \$5,603,618.41, consisting of the following items: Cash on hand and in bank, \$1,257,032.35; due from customers, \$347,149.17; prepaid expenses such as gasoline, oil, insurance, stationery, lumber, \$127,707.69; plant account, \$2,358,034.03; store accounts \$1,513,695.17.

The liabilities which total \$5,603,618.41 consist of these items: Accounts payable, \$284,621; accrued pay rolls and miscellaneous expenses, \$64,207; dealers' contract deposits and miscellaneous credits, \$116,679; contract rebates, \$34,603.41; reserves, \$276,166—consisting of \$140,934 for depreciation and \$130,101 for unearned profits; loss and gain, \$2,022,496; surplus, \$1,804,846, and capital stock, \$1,000,000.

The report of the year shows that investments in buildings and building fixtures total \$641,595 or \$73,710 more than in 1913; real estate holdings are recorded with a value of \$183,544 or an increase of \$22,500 over last year; the value of the machinery equipment is placed at \$590,415, or an increase of \$120,923 over 1913.

The real estate value of the company outside of the plant in Ford City is \$214,354 for Montreal which is an increase of \$141,645 over last year; \$199,279 for Toronto, which means an increase of \$148,278, as compared with 1913.

Like the parent company in Detroit, the growth of the Canadian Ford company has been one of the most remarkable in the history of industrial enterprises. Probably no other concern in the Dominion has grown so rapidly to such a prominent position and into such a financially strong manufacturing enterprise.

In August, 1904, the organization of the Ford Motor Co. of Canada, Ltd., was effected, the capital stock being \$125,000. The first cars were shipped in February, 1905, and the total output for 1905 was 114 cars, while total values of sales effected during the year was \$110,000.

In 1906 only 101 cars were made, of which seventy-six went to foreign countries and only twenty-five into Canada. Additional machinery was installed that year and in 1907 the production totalled 327 cars, of which 236 were disposed of in Canada and ninety-one shipped abroad. The output in 1908 was 324 and nearly one-third—114—went to foreign lands. In 1909 the first of the now famous Model T was made and that year 486 cars were built, of which 364 remained in the country.

Sales Total Over \$12,000,000

Beginning 1910 production in large quantities started and at the end of that year 1,200 cars had been made. In 1911 the output was doubled, while in 1912 the cars made totaled 6,500. The record for 1913 was more than doubled and in 1914, it is stated, about 25,000 were made and shipped. For 1915 the output schedule calls for 35,000 cars.

In 1905 there were sixteen employees on the pay roll. In 1914 there were nearly 1,200. The value of the sales, which in 1905 was \$110,000, totaled over \$12,000,000 in 1914.

Reports from Receiverships

BOSTON, MASS., Dec. 28—Judge Aldrich of the United States District Court has authorized the Massachusetts receivers of the Pope Mfg. Co. to join with the Connecticut receiver of the company in granting to the Maxwell Motor Co. an assignment of the contract of October 5, 1906, between the Pope Mfg. Co. and the Rubber Goods Mfg. Co., which

contract insured to the Pope companies on all purchases of tires the lowest market prices.

The maximum total rebate was fixed at \$250,000 in the contract. There now remains an unexpired credit of between \$140,000 to \$150,000 to the Pope company.

NEW YORK CITY, Dec. 24—The Overman Tire Co., 1853 Broadway, has filed schedules showing liabilities \$54,054 and nominal assets \$1,434,187, consisting of manufacturing and selling rights, \$1,300,000; stock, \$27,367; machinery in Passaic, \$29,961; accounts, \$29,837; automobiles, \$3,000; fixtures, \$3,279; cash in bank, \$9,645; cash on hand, \$111; notes, \$847, and insurance, \$409. The largest creditor is the Manhattan Rubber Mfg. Co., with \$44,306.

DETROIT, MICH., Dec. 26—Referee in Bankruptcy Lee E. Joslyn has ordered that the property of the bankrupt Detroit Electric Appliance Co., Fort and Fourth streets, is to be sold at public auction by the Detroit Trust Co., trustee. The property, which consists of machinery, materials, supplies, tools, office fixtures and furniture, will be disposed of either in one lot or in parcel. The bankrupt concern made the Deaco starters.

DETROIT, MICH., Dec. 28—A trustee has been appointed for the S. & M. Motor Car Co. by Referee in Bankruptcy Lee E. Joslyn. The trustee reports \$2,433.87 on hand for distribution among the creditors of the company. The final meeting of the creditors will be held at Room 205, 58 Lafayette avenue, Detroit, on January 5, 1915, 9.30 a. m.

DETROIT, MICH., Dec. 26—The personal property of the bankrupt Wahl Motor Co. was sold yesterday for \$2,100 to A. C. Barley, of Streator, Ill. Referee in Bankruptcy Lee E. Joslyn appointed Harry Moulthrop trustee. A first dividend of 3 per cent. was ordered paid to the creditors.

Burman Beats Oldfield in 50-Mile Race

LOS ANGELES, CAL., Dec. 27—*Special Telegram*—Bob Burman defeated Barney Oldfield today in the first of their series of 50-mile match races and in doing so he came very close to the half-century record, his time being 45:54, whereas Disbrow holds the mark at 45:32. Barney was 4 seconds behind Burman.

Burman drove his French Peugeot and Oldfield started in his Fiat Cyclone. On the first lap, however, the timing gears on the Fiat were stripped. Barney shifted to Earl Cooper's Stutz and the race was started over. His skill on the turns enabled him to hold Burman but on the twenty-eighth lap Bob picked up a nail which made a tire change necessary, which cost 17 seconds in which time Barney gained 1-2 mile. Burman caught him on the forty-eighth lap.

There were almost 20,000 spectators and the management was forced to close the gates. The track was dusty after ten laps. Burman carried no mechanic while George Hill rode with Oldfield. The race was from a standing start.

LOS ANGELES, CAL., Dec. 21—Arthur Klein announced today that he would have an eight-cylinder King racer at Indianapolis for the next 500-mile race. The eight-cylinder racer is to weigh 1,750 pounds and have a piston displacement of 270 inches, according to Klein.

Venice 300-Mile Race March 17

LOS ANGELES, CAL., Dec. 17—Another great road race is practically assured for Southern California during the early months of the 1915 racing season. The Venice road race date has been set and a committee appointed to apply for the A. A. A. sanction.

March 17 is the date chosen by the Venice race boosters for the 300-mile event. A purse of \$8,000 has been subscribed and this amount is to be raised to \$10,000, according to members of the race committee.

There was talk of a Santa Monica race, but there were certain citizens of the seaside city who were opposed to a 1915 race. Mayor Dudley of Santa Monica had been informed by property owners along the famous course that the city would be enjoined should any attempt be made to hold a race.

LOS ANGELES, CAL., Dec. 24—Barney Oldfield is to be president of a corporation which will build a 1 1/4-mile board motor speedway. The plans call for two 1/4-mile straight-aways with triple-radius turns. The grandstand, which is to be completed for the opening meet, is to seat 50,000, and with the infield space 100,000 can easily be accommodated.

It is Oldfield's intention to have the first race after the San Francisco events and before the drivers have to appear at Indianapolis. Oldfield will handle the American drivers.

Chalmers Has Block Cast, Valve-in-Head Six

DETROIT, MICH., Dec. 28—Today the Chalmers Motor Co. has given out the details of its model 32 new six-cylinder car to sell at \$1,400 which is to be seen for the first time at the New York show. The motor is the most unusual feature of the new Chalmers in that it is a block cast type with the camshaft overhead and operating the valves which are also in the head. The whole mechanism is completely inclosed.

The engine has a bore of 3 1-8 inches and a stroke of 5 inches and over 40 horsepower is claimed for it. Ignition is by Atwater Kent apparatus in connection with the Gray & Davis two-unit system of cranking and lighting. Other specifications include multiple dry disk clutch, cantilever rear springs underslung from the axle, three-speed gearset on the rear axle, 120-inch wheelbase, 34 by 4 tires and frame following the lines of the body so as to give good support.

In connection with the motor construction, the cylinder head unit includes the valves and their cages and the camshaft assembly. When the head bolts are removed the whole thing comes off and the pistons are exposed. The drive for the camshaft is by spiral gear. A shaft runs transversely from the crankshaft to the right side of the cylinder block, where it connects through spiral gears with a shaft running vertically upward to drive the camshaft. The shafting is all inclosed. The ignition distributor is located on the top of this vertical shaft, while the oil pump is at the bottom. Inlet valves are of nickel steel and exhausts of tungsten steel.

Other motor features are the use of Rayfield carburetor on the left side connecting it to the block by a two-branch manifold and combination splash and pressure feed oiling. The camshaft is hollow and carries oil direct to the valve mechanism. Special sectional piston rings are used, the flywheel is uninclosed and the starting unit connects to its teeth.

Drive is through inclosed shaft with the torsion tube bolted to the housing of the gearset. The axle is floating and has Timken bearings in the differential with Hyatts in the wheels, a combination used throughout the running gear. The brakes are 14 by 2 inches on rear wheel drums. The rear cantilever springs are 52 inches long with the main leaf of vanadium steel. The car has left drive and center control and the fuel tank is in the cowl. Only the five-passenger streamline touring car is offered. It is fully equipped.

Princess Car \$495 with Disco Starter

DETROIT, MICH., Dec. 26—Beginning January 1, 1915, the two-passenger Princess car, made by the Princess Motor Car Co., will be equipped with the Disco electric starter and lighting system and will be fitted with nickel-plated trimmings. The price of the car will be \$495, or an increase of \$20 over the present price, which is without the electric starter and lighting system.

The Princess is a small car having a wheelbase of 92 inches and 44 inches tread. It has a four-cylinder I head block motor, 2 3-4 by 4. The carburetor is a Holley. The transmission is a Warner selective sliding set. There are three speeds forward. The front axle is tubular and the rear axle of the semi-floating type. Hyatt roller bearings are

used throughout. The front springs are semi-elliptic and the rear are cantilever. Artillery wheels are used, having 28 by 3-inch non-skid tires.

The body is made of sheet metal with a sloping French hood and a gunboat rear deck. The road clearance is 10 inches. The equipment includes top with hood and side curtains, adjustable windshield, two gas headlights with generator tank, one oil tail light, tire holder, number bracket, electric horn and tools.

Briggs-Detroit Eight-Cylinder \$1,295

DETROIT, MICH., Dec. 28—The Briggs-Detroit Co. has brought out an eight-cylinder model with a 2 3-4 by 4.5-inch motor and 112-inch wheelbase at \$1,295. The cylinders are cast in two blocks, starting and lighting is by the Remy two-unit system and a dry-plate multiple disk clutch is used. Left drive and center control are used and the wheels are wood fitted with 34 by 4-inch tires, the rear pair being non-skids. The front axle is an I-beam and the rear floating with semi-elliptic springs at the front and platform-construction at the rear. A touring body is fitted and a sedan may be added. The standard color is Brewster green. The company states that it will not discontinue the manufacture of four-cylinder cars.

To Make Crown Prince Steel Wheel

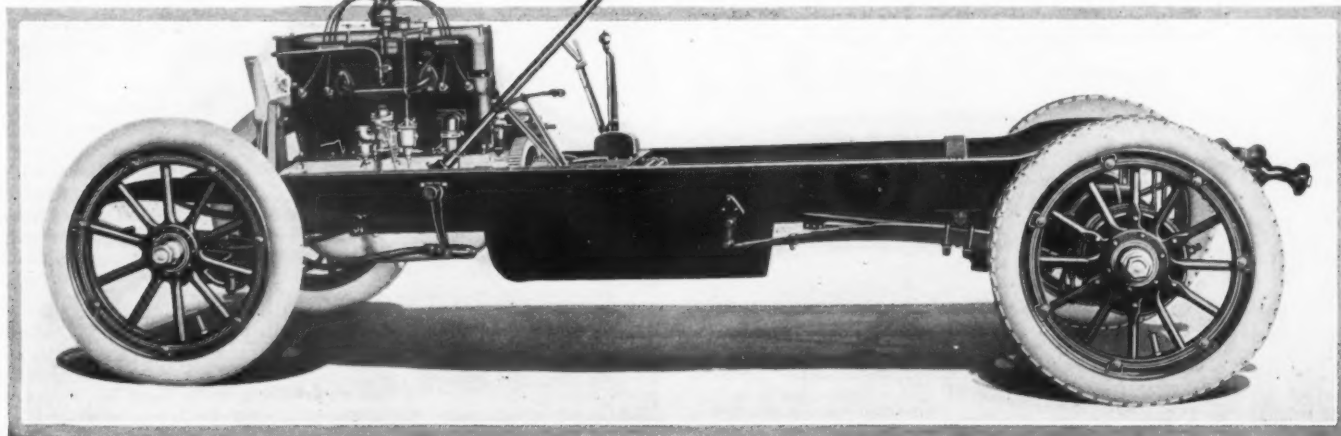
DETROIT, MICH., Dec. 28—The Crown Prince pressed steel wheel which is manufactured at Ohligs, Germany, and imported by Max Bachem, who introduced it to the American automobile trade at the New York show of a year ago, will be manufactured in this country under foreign patents by the Detroit Pressed Steel Co. The wheel is adaptable to both passenger cars and commercial vehicles.

Klaxon Announces New Price List

NEWARK, N. J., Dec. 28—On January 1 a new schedule of list prices will go into effect covering all models of Klaxon warning signals, manufactured by the Lovell-McConnell Mfg. Co., of this city. The Klaxon type L or S is now \$20; the Klaxonet, \$15; the Klaxet, \$9; the Hand Klaxon, \$7.50; the combination Klaxon with bulb horn, \$30; the combination Klaxonet, \$20.

Manzel Adds Ford Power Tire Pump

BUFFALO, N. Y., Dec. 29—The Manzel Bros. Co., this city, has brought out a new model engine-driven tire pump for Ford cars which sells for \$7.50 complete with 12 feet of hose, pressure gauge and the necessary fittings. The pump is direct driven by gears from the crankshaft and is attached by removing the lower fan belt pulley and substituting for it a Manzel combination pulley and steel gear which are integral. The pump is attached to the side of the motor, the installation requiring about 45 minutes. No machine work is necessary. The pump will fully inflate a Ford tire in 1 1-2 minutes. It will be exhibited at the New York show.



Chassis of new Chalmers model 32 six-cylinder car. Note block cast cylinders with detachable head, also cantilever rear springs. The car has a 3 1-8 by 5-inch motor, two-unit electrical system, three-speed gearset and 34 by 4-inch tires

Factory Miscellany

MAXWELL Employing More Men—A report on business conditions from the Maxwell Motor Co., Detroit, Mich., shows that the company made big gains over last year and that its business and production has gained every month since the first of August. The company employed an average of 4,250 men daily for the months of August, September and October, 1913, with an average monthly payroll of \$296,956.24. The recapitulation statement for the same months of this year shows a daily average of 5,818 men, with a monthly payroll of \$427,809.52, or an increased payroll of \$130,853.28 per month. The 30 days of November of this year make an interesting comparison, and shows that business conditions are actually better with the company since the war was declared in August. It employed 5,727 men daily during November of this year, as against 5,602 men in August of this year and 3,894 men in November of last year.

Piston Factory for Newark—The American Piston Ring Co., Newark, N. J., manufacturer of automobile pistons, will build a one-story, 75 by 150-foot plant at 378 Jelliff street.

Accessory Plant for Marion—E. C. Fox, of Marion, O., and J. W. Thomas, Cleveland, O., contemplate the construction of a factory in Marion for the manufacture of automobile accessories.

Federal Truck Gives Party—The Federal Motor Truck Co., Detroit, Mich., gave a Christmas party to all its factory and

office employees, the feature of which was the presenting to each of them of 10 per cent. of his wages.

Federal Rubber's New Addition—The Federal Rubber Mfg. Co., Cudahy, Milwaukee County, Wis., is having plans prepared for a factory addition, to be 44 by 124 feet in size, 2 stories high, of fire-proof construction. The addition is part of the \$500,000 improvement scheme instituted about July 1 of this year. The capacity of the big tire works is to be more than doubled within a year's time.

Hastings Concern Making Shock Absorbers—The Bar-Bar Mfg. Co., Hastings, Mich., has begun the manufacture of shock absorbers and pilots for motor cars. The company has offices in Grand Rapids, Mich. Edward M. Barnes, of Hastings, is president of the company, and L. W. Barnhart, of Grand Rapids, is secretary and treasurer. Territory for the company's products is being taken rapidly.

Triple Action Spring Addition Built—The Triple Action Spring Co., Chicago, Ill., recently completed its new addition, 130 by 135 feet, devoted exclusively to the repair of automobile springs and the installation of Johnson shock absorbers. Forty-two men are employed in the shop and there is a payroll of seventy-five, which includes salesmen on the road. The company recently announced a special Johnson shock absorber for Dodge cars.

Peninsular Plant Sale Jan. 7—The plant and equipment of the bankrupt

Peninsular Steel Castings Co., Iron and Wight streets, Detroit, Mich., will be offered for sale at public auction at 10 a. m. January 7, 1915. The property occupies a plot of ground 371 by 100 feet. The foundry building is 50 by 250 feet, and is equipped with machinery, tools and supplies, and could be well re-operated at once. The Security Trust Co., trustee, will furnish full particulars.

Goodyear Shows Sales Increases—Figures showing the tire production of the Goodyear Tire and Rubber Co., Akron, O., for the last 6 years have recently been compiled, showing comparison of productions beginning with 1909. In that year Goodyear made and sold 102,669 tires; in 1910 the figures were 207,442; in 1911, 332,458; in 1913, 1,132,869, and in 1914 these figures were topped by a production of 1,478,396. This accounts only for the pneumatic tire production of the company.

24-Hour Schedule for Kissel—The truck shops of the Kissel Motor Car Co., Hartford, Wis., will maintain a 24-hour schedule for at least 30 days more to insure a quick production of the war orders placed recently. The company also has booked a large order for taxicabs from Los Angeles. Not before in the history of the Kissel shops has it been necessary to work on Christmas Day, or even during the holiday period. In former years the week has been used for inventory and overhauling, but this year operations are not only uninterrupted, but on a double-time schedule.

The Automobile Calendar

Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 2-9.....New York City, Automobile Salon, Grand Ball Room of Astor Hotel, Automobile Importers' Alliance, E. Lascaris, Pres.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 5-7.....New York City, Engineering Societies' Bldg., Winter Meeting Society of Automobile Engineers.
Jan. 7-9.....Pasadena, Cal., Show, Hotel Maryland Amphitheater.
Jan. 8-14.....Milwaukee, Wis., Show, Auditorium, Milwaukee Auto. Dealers' Assn.
Jan. 9.....San Diego, Cal., Road Race.
Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.
Jan. 16.....Detroit, Mich., Show.
Jan. 16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.
Jan. 20-28.....Lancaster, Pa., Hiemenz Auditorium.
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 23-30.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 25-30.....Fall River, Mass., Show.
Jan. 25-30.....Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.

Jan. 30-Feb. 6....Columbus, O., Show, Memorial Hall, Columbus Auto Club and Columbus Auto. Trades Assn.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show, Portland Auto Trade Assn.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 1-6.....Louisville, Ky., Show, Louisville Auto. Dealers' Assn., First Regiment Armory.
Feb. 2-7.....Kalamazoo, Mich., Show, Armory.
Feb. 8-13.....Toledo, O., Show, Terminal Bldg., Toledo Auto. Shows Co., H. W. Blevins.
Feb. 8-14.....Kansas City, Mo., Show.
Feb. 9-12.....Eau Claire, Wis., Eau Claire Auto. Dealers' Assn.
Feb. 15-20.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids Herald; C. L. Merriman.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 15-20.....Bridgeport, Conn., Show, State Armory; B. B. Sterber.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.

Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 8-13.....Canton, O., Show, Auditorium, Stark Co. Auto. Show and Electrical Exposition.
Mar. 8-13.....Des Moines, Ia., Show, C. G. Van Vleet.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 17.....Venice, Cal., 300-Mile Road Race.
April.....Calumet, Mich., Show, Coliseum.
May 17-18.....Boston, Mass., A. A. A. Annual Meeting.
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9.....Galesburg, Ill., Two-mile Track Meet.
June 16.....Chicago, Ill., Speedway, 500-Mile Race, Speedway Park Assn.
June 25.....Sioux City, Ia., Track Meet.
July 4.....Tacoma, Wash., Road Race.
Aug. 20-21.....Elgin, Ill., Road Race.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.

The Week in the Industry



Motor Men in New Roles

BROWN BROS. Manager Arrives in N. Y.—B. R. Banks, manager of the motor department of Brown Bros., Ltd., London, arrived in New York City on the Lusitania, December 22. His address will be at the Oliver Bros. Purchasing Co., 71 Murray street, that city, where he will make appointments with manufacturers of American automobile accessories, with a view to their sale in Europe. Brown Bros., Ltd., is one of the largest jobbers in the United Kingdom, and already has the sole representation of the Raybestos brake lining, Gabriel horns and snubbers, Gleason Peters pumps, Edmunds & Jones lamps and New-Departure cycle sundries.

Donohue N. Y. Federation Secretary—G. C. Donohue has been named secretary of the New York State Motor Federation.

Lee Oldfield Heads Repair Dept.—Lee Oldfield, a race driver, has taken charge of the repair department of the Minnesota Automobile Laundry and Service Garage, Minneapolis.

Levey Joins Auto Parts Co.—Wm. B. Levey, formerly purchasing agent of the Borland-Grannis Co. and later of the American Electric Car Company is now purchasing agent of the Auto Parts Co., Chicago, Ill.

McNulty Saxon Representative—The Saxon Motor Co., Detroit, Mich., has appointed C. L. McNulty southern district representative. Mr. McNulty was for several years a district representative of the Studebaker Corporation.

New Oldsmobile Appointments—The Olds Motor Works, Lansing, Mich., recently appointed J. M. Otero as its representative for the island of Cuba, with a location on Paseo de Marti, at Havana. It also appointed Sojo & Co. agent for the Porto Rican territory.

Thompson Heads Morse Chain Branch—F. C. Thompson, formerly assistant chief engineer of the Lozier Motor Co., Detroit, Mich., has been appointed manager of the Detroit branch of the Morse Chain Co., Ithaca, N. Y., which has been opened in the Dime Savings Bank Building, Detroit.

Studebaker Promotions—Vice-President Benson, of The Studebaker Corp., Detroit, Mich., has appointed H. T. Myers manager of the department of delivery car sales. G. N. Jordon, traveling representative, succeeds Mr. Myers as manager of the corporation's Boston branch.

Finch Joins Standard Truck—E. B. Finch, who has been connected with the Packard Motor Car Co. and the Chalmers Motor Co., in their executive departments, has been appointed general sales manager of the Standard Motor Truck Co., Detroit, Mich. Mr. Finch will also be first assistant to President Albert Fisher.

Bayliss Cadillac Manager—J. E. Bayliss has been appointed Western district manager for the Cadillac Motor Car Co., Seattle, Wash., succeeding A. E. Landman, who resigned to join partnership

with Don Lee, Cadillac distributor in California. Mr. Bayliss formerly was representative of the Packard Motor Car Co. and has been identified with the motor industry since its inception.

Garage and Dealers' Field

Benz Opens N. Y. Service Dept.—The Benz Automobile Sales Corp., New York City, importer of Benz cars and local distributors of Kissel cars, has opened a complete service department on West 55th street.

Flanders Electric Opens in Detroit—Salesrooms have been opened at 270 East Jefferson avenue, Detroit, Mich., by the Flanders Electric, Inc., Pontiac, Mich., manufacturers of the Flanders electric cars.

K. P. Headquarters in N. Y. City—The K. P. Foot Rest Heater Co., which formerly had its headquarters in Boston, Mass., has established its main office and New York distributing station at 250 West 54th street, New York City.

J-M Factory Branch in N. Y. City—The J-M Shock Absorber Co. has opened a direct factory branch at 250 West 54th street, this city. Edward Knauss, who was formerly Boston distributor for the J-M company is in charge of the local factory branch.

Takes Minneapolis Gibney Agency—The Northwestern Tire Co., Minneapolis, F. J. Kerner, manager, has taken over the northwestern agency for the Gibney solid tire, made in Philadelphia. This is the first time the Gibney has ever been handled in the northwest.

New McGraw Factory Branch—The McGraw Tire & Rubber Co., of East Palestine, O., maker of the Imperial, Pullman and Congress tires, and the McGraw solid tires, has opened a branch in Boston, Mass., at 667 Boylston street, with W. G. Page as manager.

Handling Century Starter—G. M. Weatherbee and C. A. Orr, formerly of the Hollander Motor Car Co., Boston, Mass., agent for the Cartercar, have formed a company to handle the Century starter for Ford cars with salesrooms at 29 Cambria street. Their territory includes Maine, Massachusetts and Rhode Island.

New Electric Garage for Detroit—The Indian Village Garage has been opened at 1524 Jefferson avenue, Detroit, Mich., by A. H. Dorsey, until recently manager of the local branch of the Anderson Electric Car Co. The garage has been built to take care of seventy-five electric vehicles and a small number of gasoline cars. The entire floor of 75 by 200 feet is free from posts.

Studebaker Buyers Receive Long Trips—An automobile dealer in the State of Washington has offered to a club of five customers a free trip from the Northwest to Detroit. The maker of the offer is Henry J. Layman, Studebaker dealer at Waterville, Wash., who has advertised publicly that within 60 days from date of

his advertisement all persons purchasing Studebakers will be given the free trip.

Secure Philadelphia Disco Agency—Carlile and Doughty, electrical and mechanical engineers, formerly of 406 South 8th street, Philadelphia, Pa., are the newest acquisitions to Automobile Row, now occupying 846 North Broad street, and have secured the agency for the Disco electric starting and lighting system for Ford cars.

Purchases Property—The Seaman-Sivyer Co., Milwaukee, Wis., a large independent oil and grease interest, has purchased the Phelps property at 249-251 Lake street, part of which it has occupied since its organization in August, 1913, and will occupy the entire building. Charles H. Seaman is president and Howard M. Sivyer vice-president of the company.

Palmyra Agent to Enlarge—Otto E. Scherer, agent for the Buick at Palmyra, Wis., and owner of one of the largest garage businesses in southern Wisconsin, will expend from \$15,000 to \$20,000 during the first half of 1915 in enlarging his buildings. When the improvements are completed, Mr. Scherer will have a building devoted exclusively to display and repair space and another for dead and live storage, washing, etc.

Last of Vermont Toll Road—The famous Peru turnpike in Vermont, one of the very few remaining toll roads in the East, will soon be abolished as the state has decided to either take it over by purchase from its owners or by right of eminent domain. It lies in the towns of Windham, Londonderry and Peru. The agitation for abolishing it began with motorists, who did not like to be paying toll every time they happened to pass that way.

Buick's Big Pacific Coast Shipment—Seattle will be the terminus of the first trainload of automobiles to come to the Pacific Coast in 1915, orders having been placed with the Buick Motor Co. for 200 pleasure and commercial models by the Northwest Buick Co., Seattle. The machines will be shipped in forty freight cars, and left Flint, Mich., on Christmas Day. They are coming in a special train, and the freight charges alone amount to \$18,000, while the entire shipment is valued at \$250,000. The machines are for distribution in Washington and Oregon.

Wis. Farmers After Insurance Business—Wisconsin farmers' mutual insurance companies are out to capture a share of the motor car underwriting business now controlled by stock companies. In the calls for annual meetings of more than fifty of the leading farmers' mutuals, it is stated that the question of authorizing the boards of directors to insure motor cars will be the most important proposition for consideration. The proposition grows out of the enormous number of cars now in the hands of farmers, who demand the low rate of insurance on their machines that is provided by the mutuals on their other farm property, including machinery.

DECEMBER 24, 1914

10 CENTS A COPY

The AUTOMOBILE



BRISCOE

Today the Briscoe is the car of big demand, as we can readily prove to you.

The BRISCOE is the car that the medium sized car buyer looks up to with a hopeful prospect of possession.

Perhaps he is the owner of some good small car, but wants a more ambitious one for the coming season. For some time he has felt that he ought to be able to get a lot more value—more high grade features, more smartness, better riding quality; in a word, *more car* for his \$1000 or less; in fact—a BRISCOE.

On the other hand, a BRISCOE is pre-eminently the car that is going to attract the buyer accustomed to a big and more expensive car. Such a man needs mighty little saleswork. He is motor-wise, used to quick decisions on important matters, and will sell himself—if given a chance to look a BRISCOE over.

It is the converging of these two different public demands that makes the BRISCOE, at \$785, THE CAR OF BIG DEMAND—the *ideal car for every Owner-Driver*.

Are you likely to do better than by handling the car that pleases one large class by its supreme value, and another large class by the very moderate figure at which it is offered?

(Better get in touch with us AT ONCE.)

\$785⁰⁰

**COMPLETELY
EQUIPPED**



BRISCOE MOTOR COMPANY · JACKSON MICH



WILL IT STAND UP?

How Much Will It Cost To Keep?

These are the points you want to satisfy yourself on when choosing between this or that make of car.

Exterior "Humming Birds," such as gaudy and unnecessary refinements of equipment, won't help to keep down maintenance cost nor make the car stand up.

Look to the VITALS—the parts which are subjected to WEAR.

How good are they?

What are they made of?

These are the points you should look into and have a right to be told about.

Make sure of the VITALS, *then* look to the "Humming Birds"—BUT, first, last and all the time, be *sure* of the VITALS.

The greatest cars built in America today use



for their non-adjustable wear-subjected bushing parts.

These non-adjustable bushing parts are the most vital of all wear-subjected parts because when they show any wear at all, it will mean that you have to tear the car to pieces to renew them.

THE BEST BUY IS THE CAR THAT WILL STAND UP LONGEST—NOT THE CAR WITH THE BEST OR MOST "HUMMING BIRDS."

AMERICAN BRONZE COMPANY

BERWYN

PENNSYLVANIA



Please mention The Automobile when writing to Advertisers

January 1st 1915

ANNOUNCING
THE BEARINGS COMPANY & AMERICA
SUCCESSOR TO

J. S. BRETZ COMPANY, *NEW YORK*
FICHTEL & SACHS, *LANCASTER, PA*
STAR BALL RETAINER CO. *LANCASTER, PA*

F&S ANNULAR BALL BEARINGS
BALL THRUST BEARINGS
STAR BALL RETAINERS
BOWDEN WIRE MECHANISM
GERMAN STEEL BALLS



Sales Department
250 WEST 54TH STREET
NEW YORK

The AUTOMOBILE

THE CLASS JOURNAL COMPANY
231-241 W. 39th STREET NEW YORK CITY

TABLE of CONTENTS

VOL. XXXI

NEW YORK, DECEMBER 31, 1914

No. 27

NEW YORK SHOW ISSUE

| | |
|---|------|
| 1915—A 7-League Stride..... | 1187 |
| Block Castings the Big Trend..... | 1194 |
| Bodies for 1915..... | 1199 |
| Price Classification of 1915 Cars..... | 1215 |
| Passenger Car Specifications for 1915..... | 1220 |
| Engineering Development—1915..... | 1228 |
| Events Scheduled for Show Week..... | 1261 |
| A Directory of Automobile Makers..... | 1262 |
| Gear-Driven Bosch Magneto for Ford..... | 1264 |
| Worm Drive Adopted by Locomobile on New 3 and 4-Tonners.... | 1264 |
| Frictional Resistance in New Hartford Shock Absorber..... | 1265 |
| Simms-Huff Motor-Generator..... | 1266 |
| Negative Lap Gains in Valve Timing..... | 1267 |
| Vulcan Gearshift Stronger and Lighter..... | 1272 |
| The Improvement of Spring Suspension—III..... | 1274 |
| Glass Radiator Betrays Poor Circulation..... | 1277 |
| Editorial: Little Truck Show..... | 1278 |
| The Eight The 1915 Will | |
| Motor Values 1915 Specifications | |
| Accessories Active | |
| Handley Forms \$1,000,000 Company..... | 1280 |
| Automobile Securities Quotations..... | 1280 |
| Market Reports for the Week..... | 1281 |
| Rubber Industry Protests Embargo..... | 1281 |
| Show to Open with 360 Exhibits..... | 1282 |
| Canadian Ford Profits \$2,022,496 in 1914..... | 1283 |
| Chalmers Has Block Cast, Valve-in-Head Six..... | 1284 |
| Factory Miscellany..... | 1285 |
| The Automobile Calendar..... | 1285 |
| The Week in the Industry..... | 1286 |

Index to Advertisers106-107

SULZBERGER'S *Sterilized* CURLED HAIR

*Automobile Upholstery
De Luxe*

LUXURIOUSLY ✧ RESTFUL ✧

In a heavy percentage of motor car sales the lady is the important deciding factor. Luxurious, restful upholstery is one of the little things that count big in her decision. Other things equal, the sale goes to the car upholstered with

SULZBERGER'S STERILIZED CURLED HAIR

Automobile Upholstery De Luxe

Its rare resiliency insures ease and relaxation on any road—
Its durability assures prolonged wear—
Its slightly higher price is but practical economy. In the long run it costs less than cheap substitutes. A big selling point for your new model cars, is upholstery trimmed with SULZBERGER'S Sterilized Curled Hair.

WRITE FOR SAMPLES

SULZBERGER & SONS CO.

Chicago  Illinois

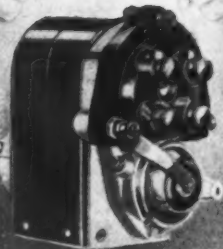


SPLITDORF

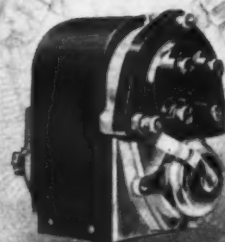
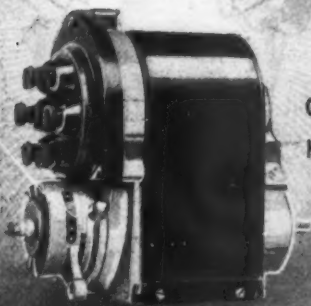
DIXIE
TYPE



MODEL EU4
HIGH TENSION
MAGNETO



CUNNINGHAM
HIGH TENSION
MAGNETO



MODEL EU4-2
HIGH TENSION
MAGNETO

SPLITDORF IGNITION devices for the 1915 season include several new types of magnetos of the high-tension variety. These have been designed to meet the clamor of automobile engineers for even more effective units for the popular demand.

Model EU4-2 is a big brother to the highly successful model EU4, being more powerful with its double magnets, and made for 4-cylinder motors developing as high as 40 horsepower. As standard equipment on 1915 *Overland* cars, among other makes of automobiles, the efficiency of the EU4-2 is "hall-marked" in view of the severe tests to which many thousands have been subjected.

Two new types of high tension magnetos, constructed particularly for easy starting without the use of battery, auxiliary coils or any external devices, are the DIXIE and the CUNNINGHAM.

The DIXIE TYPE is distinctly *new* and contains many interesting and valuable features—platinum points external to the main breaker-box—no wire on any of the revolving parts—field coil housed in the arch of the magneto—with timing lever at retard or advance the spark is of the same strength for any given speed—minimum loss of energy, etc. In the construction of the CUNNINGHAM there is practically no difference in the strength of the spark when the break is in advanced or retarded position, the speed remaining the same. By its construction an advance of 70° is obtained which is essential for long-stroke slow-speed 6-cylinder engines.

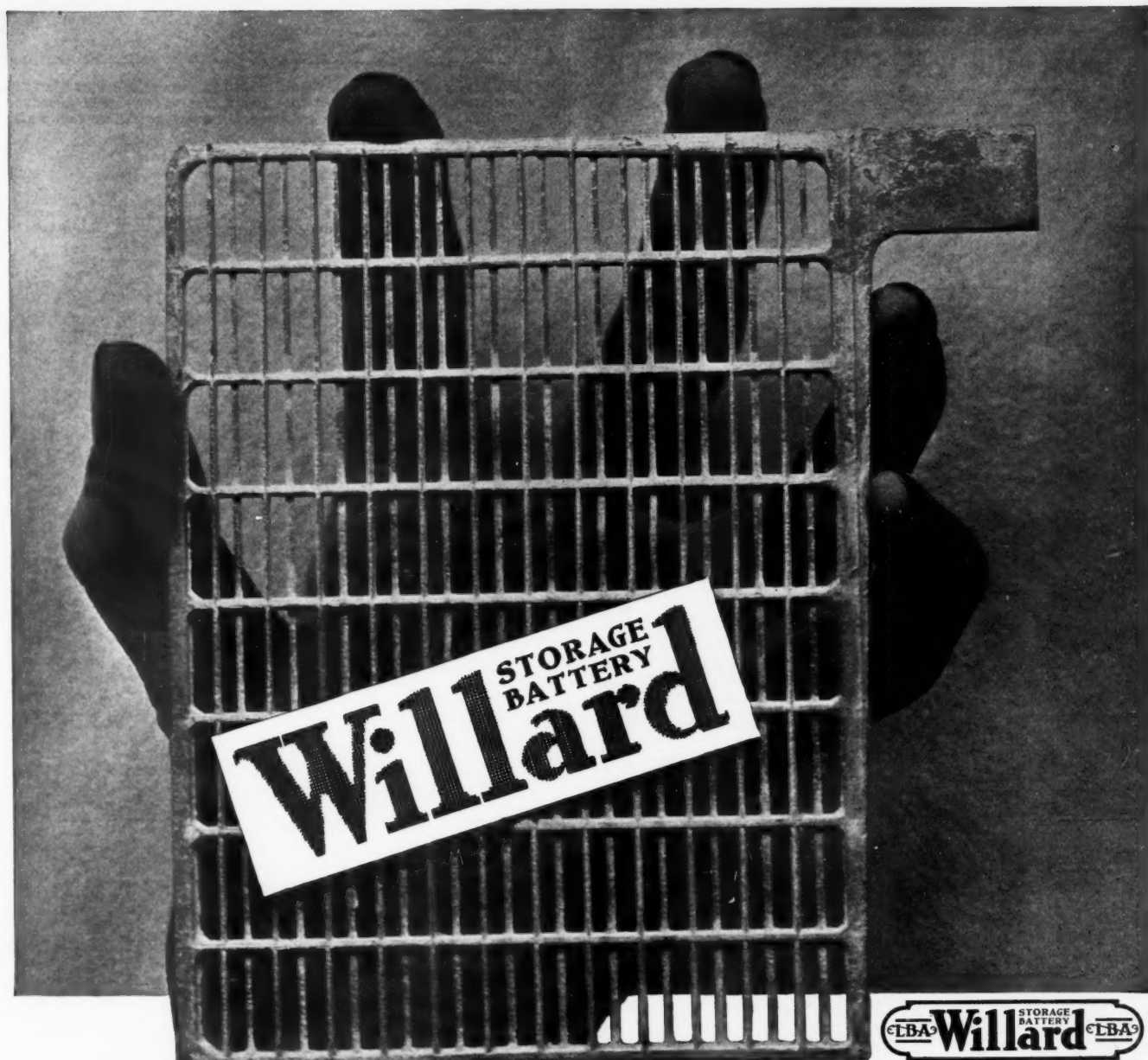
Operating slower than any engine will turn over on its own power and well below the limit for cranking speed, an equipment of either the DIXIE TYPE or the CUNNINGHAM overcomes every excuse for having batteries around the car for ignition purposes. All that is necessary with either, is a simple switch for shorting the magneto when stopping.

Study our exhibits:

New York Show: Space C-47
Chicago Show: Spaces 58-71

SPLITDORF ELECTRICAL CO.
NEWARK, N. J.

(All SPLITDORF features are fully covered by patent or patents pending)



Anybody Can Make a Grid, but—

It takes experience and knowledge of a high order to make a thoroughly satisfactory storage battery plate.

With twenty kinds of lead oxides and twenty different ways of mixing them, there is an unlimited number of ways of going wrong.

Eternal vigilance is the prime factor—and every operation in the Willard plant is followed by inspection. Every pound of metallic lead has to be up to the Willard standard. Every grid is inspected when it comes from the mold. Samples of every keg of oxide go to the laboratory for inspection and testing. When the oxides are mixed they are tested. When the plate is pasted it is inspected, and again after it is dried. While the plates are "forming" the tempera-

ture and specific gravity of the electrolyte is under constant inspection and readings of the terminal voltage taken hourly.

Every batch of plates is subjected to laboratory test, and so is every lot of completed batteries.

Inspection is not the only reason that 85 per cent. of all makers of electrically equipped cars specify Willard Batteries, but is one of the big reasons for their uniformly good service and long life.

Willard Storage Battery Company Cleveland, Ohio

New York: 228-30 W. 58th St. Detroit: 736-40 Woodward Ave.
Chicago: 2524-30 S. Wabash Ave. San Francisco: 821 Monadnock Bldg.
Indianapolis: 318 North Illinois Street
SERVICE STATIONS IN ALL PRINCIPAL CITIES IN THE
UNITED STATES, CANADA AND MEXICO

Please mention The Automobile when writing to Advertisers

KOEHLER ONE TON TRUCK \$750

GREATEST VALUE AT THE PRICE • LOWEST PRICE • CAPACITY



Here are brief specifications: MOTOR, 24 H.P., water cooled, 4 cycle; IGNITION, high tension magneto. TIRES, 35 in. solid std. removable, also NON-SKID DEMOUNTABLE PNEUMATIC TIRES OPTIONAL at extra price. TREAD, 58 in. AXLES, 2 in. sq. rear, 1 1/2 in. front. TRANSMISSION, proved RIGHT by years of use, runs in oil bath.

TEN BODY TYPES

KOEHLER \$750

ONE TON TRUCK

SEND FOR CATALOGUE DEALERS

How about your city or town—is it Koehlerized, or waiting for someone to reap a harvest from sales? Will it be you, or one of your competitors, who will make it hard for anyone else to sell any other make of truck? The Koehler is a great money-maker for dealers, being the lowest-priced ton truck and giving greatest value at any price.

Our Traveling Representatives Are Now Covering the Entire Country and each has a truck with him. Notify us at once if you are interested as a representative may now be in your section. You do not want to miss a chance to see this truck. Our complete catalog and selling plan should be in your hands—send for these.

H.J. KOEHLER S. G. CO., 281 Halsey St., Newark, N. J.

KOEHLER ONE TON TRUCK \$750

For Leaky Cylinders

Superior to All Others



EVER TIGHT

PATENTED AUGUST 6, 1912

A Piston Ring Which Gives Compression in "Out-of-Round" Cylinders as Perfectly as in True Ones



Beware the "Just as Good." Don't be fooled by imitations

Here is a piston ring that gives 100% efficiency to every type of motor, engine, compressor or pump. Ideally adapted to use in Automobile and Motorboat engines. Gives compression when all others fail. No need to rebore worn cylinders—simply install EVER-TIGHT piston rings and the motor is good as new.

EVER-TIGHT piston rings are made up of three individual, interlocking rings, grooved together to give flexibility and reduce friction. This three-part construction is clearly seen in illustrations above. This is the only three-piece piston ring on the market.

If dealers do not carry EVER-TIGHT piston rings, Auto repair men should write us.

Jobbers and dealers wanted everywhere. Write for particulars.

THE EVER-TIGHT PISTON RING CO.
1437 CHESTNUT STREET ST. LOUIS, MO.

Index to Advertisers

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

| | |
|----------------------------------|---------|
| Adamson Mfg. Co. | 164 |
| Allen Auto Specialty Co. | 107 |
| American Ball Bearing Company | 184 |
| American Bronze Co. | 1 |
| Apple Electric Co. | 168 |
| Atwater Kent Manufacturing Works | 232 |
| Automobile Blue Book Pub. Co. | 231 |
| Automobile Supply Mfg. Co. | 215 |
| Automobile Trade Directory | 238-239 |

B

| | |
|-----------------------------|------------|
| Baker Motor Vehicle Co. | 142 |
| Bearings Co. of America | 2 |
| Bosch Magneto Co. | 237 |
| Boston Clock Co. | 115 |
| Braender Rubber & Tire Co. | 161 |
| Bricton Mfg. Co. | 116 |
| Broderick & Bascom Rope Co. | 169 |
| Brown-Lipe Gear Co. | 145 to 160 |
| Buckeye Furnace Co. | 118 |
| Buda Company | 128 |

C

| | |
|---|------------|
| Cadillac Motor Car Co. | 195 |
| Champion Spark Plug Co. | 197 to 200 |
| Chase Co., L. C. | 246 |
| Chelsea Clock Co. | 115 |
| Cleveland-Canton Spring Co. | 188 |
| Commercial Research Co. | 118 |
| Connecticut Telephone & Electric Co. | 174-175 |
| Continental Motor Manufacturing Company | 226-227 |
| Copley-Plaza | 250 |
| Corbin-Brown Speedometer | 107 |
| Corcoran Lamp Company | 116 |
| Cox Brass Mfg. Co. | 228-229 |
| Cullman Wheel Co. | 114 |

D

| | |
|------------------------------------|---------|
| Dann Oil Cushion Spring Insert Co. | 242 |
| Disco Electric Starter Co. | 243 |
| Dyneto Electric Co. | 209-212 |

E

| | |
|---------------------------------------|---------|
| Edmunds & Jones Manufacturing Company | 119 |
| Eisemann Magneto Company | 162-163 |
| Electric Auto-Lite Co. | 185 |
| Ever-Tight Piston Ring Co. | 106 |

F

| | |
|-------------------------|---------|
| Fafnir Bearing Co. | 128 |
| Falls Rubber Co. | 247 |
| Fedders Mfg. Co. | 204-205 |
| Federal Rubber Mfg. Co. | 186 |

G

| | |
|-------------------------------|-----|
| Gaulois Tire Corp. | 127 |
| Geuder, Paeschke & Frey Co. | 137 |
| Gibson Automobile Co. | 144 |
| Goodrich Co., B. F. | 118 |
| Goodyear Tire & Rubber Co. | 138 |
| Gorson's Automobile Exchange | 127 |
| Gould Storage Battery Co. | 125 |
| Gray & Davis Inc. | 244 |
| Grossman Mfg. Co., Inc., Emil | 201 |
| Gulf Refining Company | 193 |
| Gurney Ball Bearing Company | 196 |

H

| | |
|--------------------------|---------|
| Haynes Automobile Co. | 182-183 |
| Heinz Electric Co. | 114 |
| Herff-Brooks Corporation | 194 |
| Herz & Co. | 139 |
| Hess-Bright Mfg. Co. | 251 |
| Hess Steel Company | 119 |
| Holley Bros. Company | 117 |
| Houk Mfg. Co. | 118 |
| Hyatt Roller Bearing Co. | 118 |

I

| | |
|-----------------------------|-----|
| Interstate Electric Company | 225 |
|-----------------------------|-----|

J

| | |
|------------------------|---------|
| J-M Shock Absorber Co. | 241 |
| Jeffery Co., Thos. B. | 248-249 |
| Johns-Manville Co. | 141 |

K

| | |
|---------------------------|-----|
| Kimball Tire Case Company | 119 |
| Kissel Motor Car Company | 116 |
| Koehler S. G. Co. H. J. | 106 |
| K-P. Foot Rest Heater Co. | 240 |
| K-W Ignition Co. | 126 |

Index to Advertisers

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

| | |
|--------------------------------|------------|
| L | |
| Lexington-Howard Company..... | 221 to 224 |
| Locomobile Co. of America..... | 245 |

| | |
|------------------------------------|--------------|
| M | |
| Manzel Bros. Co..... | 166-167 |
| Master Carburetor Corporation..... | 116 |
| Mayo Radiator Co..... | 192 |
| Mercer Automobile Company..... | 191 |
| M. & S. Gear Co..... | 143 |
| Metal Specialties Mfg. Co..... | 130 |
| Metz Company..... | 130 |
| Motor Car Mfg. Co..... | Front Cover |
| Motor World Pub. Co..... | 214 |
| Moss Photo Engraving Co..... | 126 |
| Mutty Co., L. J..... | Second Cover |

| | |
|-----------------------------------|---------|
| N | |
| National Can Co..... | 213 |
| National Motor Vehicle Co..... | 165 |
| New Departure Mfg. Co..... | 216-217 |
| New Process Gear Corporation..... | 116 |
| N. Y. & N. J. Lubricating Co..... | 119 |
| Nordyke & Marmon Company..... | 170-171 |

| | |
|---------------------------|------------|
| O | |
| Oakland Motor Car Co..... | 173 |
| Owen & Co., R. M..... | 133 to 136 |

| | |
|----------------------------------|-----|
| P | |
| Packard Motor Car Co..... | 252 |
| Pantasote Company..... | 120 |
| Paterson Co., W. S..... | 220 |
| Pennsylvania Rubber Company..... | 119 |
| Prest-O-Lite Co..... | 116 |
| Prosser & Sons, Thomas..... | 118 |

| | |
|--------------------------------|------------|
| R | |
| Rajah Auto Supply Co..... | 118 |
| Rayfield Carburetor Co..... | 218 |
| Republic Rubber Co..... | 119 |
| Robinson & Son Co., Wm. C..... | 116 |
| Royal Equipment Co..... | 121 to 124 |
| Rutenber Motor Co..... | 117 |

| | |
|---|------------|
| S | |
| Salisbury Wheel & Manufacturing Co..... | 119 |
| Sanford Motor Truck Company..... | 120 |
| Scripps-Booth Company..... | 230 |
| Searchlight Company..... | 114 |
| Shaler Co., C. A..... | 126 |
| Sheldon Axle & Spring Co..... | 177 to 180 |
| Smith & Hemenway Co..... | 130 |
| Sparks-Withington Company..... | 114 |
| Specialty Sales Co..... | 131 |
| Sphinx Motor Car Co..... | 132 |
| Splitdorf Electrical Company..... | 4 |
| Springfield Metal Body Co..... | 202-203 |
| Star Ball Retainer Co..... | 116 |
| Stewart Motor Corp..... | 219 |
| Stewart-Warner Corp..... | 233 to 236 |
| Stromberg Motor Devices Company..... | 206-207 |
| Stutz Motor Car Co..... | 208 |
| Sulzberger & Sons Co..... | 3 |

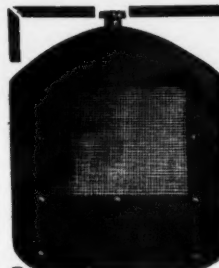
| | |
|------------------------------------|-----|
| T | |
| Thermoid Rubber Co..... | 172 |
| Trinity Bell Electric Mfg. Co..... | 146 |
| Troy Wagon Works Co..... | 130 |
| Tuthill Spring Co..... | 116 |

| | |
|------------------------------|-----|
| U | |
| Underwood Typewriter Co..... | 190 |
| U-H Magneto Co..... | 130 |

| | |
|--------------------|-------------|
| V | |
| V-Ray Company..... | Third Cover |
| Vulcan Car Co..... | 117 |

| | |
|--------------------------------------|------------|
| W | |
| Wagner Electric Starter Co..... | 181 |
| Warner Gear Co..... | 125 |
| Weed Chain Tire Grip Co..... | 187 |
| Westinghouse Electric & Mfg. Co..... | 189 |
| Weston Electrical Instrument Co..... | 118 |
| Wheeling Stove & Range Co..... | 120 |
| Whitney Mfg. Co..... | 127 |
| Willard Storage Battery Co..... | 105 |
| Willys-Overland Co..... | Back Cover |

| | |
|--------------------------------|-----|
| Z | |
| Zenith Carburetor Company..... | 176 |



The ALLEN RADIATOR COVER

will keep your radiator from freezing in the severest weather. Quickly adjustable for varying temperatures and easily attached to the radiator. Made to order of Fabric Leather, fully lined with first quality Robe Plush at \$6.00. Standard "Allen" quality work throughout.

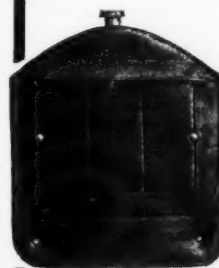
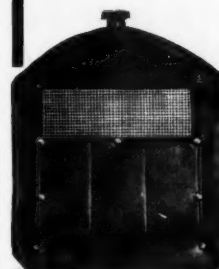
At Your Dealers!

or write the manufacturer direct.

We also manufacture the Famous Allen Tire Case, the perfect protection for spare shoes, and the Allen Tyrometer, the handy, accurate Tire Pressure Gauge.

The Allen Auto Specialty Co.

1926 Broadway, New York
1627 Michigan Avenue, Chicago



The CORBIN-BROWN SPEEDOMETER

"The Speedometer of Absolute Accuracy"

Will exhibit at the New
York Automobile Show,
Jan. 2 to 9, inclusive,
Space C-102, 3rd Floor.

Quality

In material, workmanship and design the Corbin-Brown Speedometer is characterized by the same high standards of quality which for years have stamped all products of the Corbin Screw Corporation as thoroughly dependable. Neither time nor money have been spared in making the Corbin-Brown Speedometer exactly what a speedometer should be—accurate and durable. It is fully guaranteed. Our catalog illustrating numerous styles and models will be sent immediately upon request.

THE CORBIN SCREW CORPORATION

The American Hardware Corporation, Successors

NEW BRITAIN, CONN.

BRANCHES: New York Chicago Philadelphia
Makers of Corbin Brakes and Automatic Screw Machine Parts

The Clearing House

of the Automobile Industry

For Second-Hand Cars, Surplus Parts, Accessories, Tires Machinery & all other special Announcements of a similar Character

CARS FOR SALE

Bought—TRUCKS—Sold
If you wish to sell your truck, to buy a truck, to rent a truck, write us—we have the largest assortment of new and used trucks in New York City. **Hayes-Diefenderfer Co.,** 21 W. 62nd St., N. Y. City.

GUARANTEED AUTOMOBILES—ANY MAKE
at your price. Write us your wants. Engines, Axles, Bodies, anything at prices that will surprise you. Satisfaction or money back.
Progress Brokerage Co.,
527 Grant St., Buffalo, N. Y.

LANCIA

1914 enclosed runabout, equipped with wire wheels, electric lights and starter. Special design body. Perfect for winter or summer. Cost \$6,450.00 last April. Run 3,900 miles. Factory guaranteed. Our price \$3,500.00.

THE LEEPER and HUNT CO.

1700 Broadway New York City

MARION, 5-PASSENGER
Fully equipped, torpedo body, electric lighted and up-to-date in every way. Will sacrifice if taken at once
Condon
2635 Wabash Ave., Calumet 5811, Chicago, Ill.

MERCER CARS

The following cars have just been overhauled, are in first class condition and fully equipped:
Type 35 Series B, 5 passenger.
Type 35 Series H, 5 passenger.
Type 35 Series K, 2 passenger.
Also 1 type 35 Series M, 5 passenger which is new and has never been driven.

LEONARD G. SCHREIBER,
Box 18 Evanston Station Cincinnati, O.

FOR SALE

FOR SALE OR RENT

Fully equipped garage at West End, New Jersey, with complete machine shop; absolutely fireproof; well lighted; independent water supply; splendid location near station; accommodates 35 cars; 80 feet front, 200 feet deep. For sale or will lease to responsible party at reasonable rental.
Address **Box T 532, care The Automobile**

GARAGE SIGN FOR SALE

Electric lighted, all steel and glass, garage sign for sale cheap; no better sign built. The best and most efficient, day and night, double sign, you ever saw.

Sign has two sides, 76" long, 21" high. Write at once for picture, price, etc.

Burton's Garage
Schoharie, N. Y.

PARTS AND ACCESSORIES

FOR SALE

A.A.A. STODDARD-DAYTON A.A.A.
REPAIR PARTS

You will always be able to get them from the

DAYTON AUTO REPAIR CO.,
351-55 West 52d St.,
New York City.

A New Year Bargain List

New American 30 Coupe body, upholstered \$175.00
New Croxton 5-passenger, Taxicab body... 200.00
Roadster and 5-passenger bodies.....\$10.00 up
Send measurement of what you want.
Hess full floating rear axle, complete.... 80.00
A. O. Smith full floating axle..... 75.00
Weston-Mott full floating N. D. bearings. 70.00
The above axles suitable for 3500 lb. cars.
Al-Beam axles with ball bearing hubs.... 12.00
New Buda motors 40 HP.....160.00
Milwaukee motor 4-5-16 x 4 1-2..... 90.00
Ford one man mohair tops with jiffy curtains and slip cover..... 30.00
Racing seats upholstered 16" high, 17" deep 25.00
2 1-2 to 1 and 3-1 Ford differential gears, pair 15.00
Helical cut Ford timing gears, pair..... 2.50
Repairs for Michigan, F.A.I., Elmore Deal, Midland, American and Croxton Cars.
GET OUR LIST.

Department L

AUTO PARTS COMPANY
737-39 W. Jackson Blvd., CHICAGO

ALL KINDS OF PARTS
Pierce-Arrow, Studebaker, Mitchell, Thomas, Cleveland 2 cyl. Buick and 4 cyl. Atlas Parts. Rutenber Motor, Gears, Crank shafts, Coils, Carburetors and Motors. Write me when in need of old parts.
J. Rosenfield, 521 E. 6th St., Boston, Mass.

All Parts in Stock at Discount

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Sta-Rite Rings, \$1.00 Each.
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Why not get a Schebler Model R carburetor for your car? Our exchange proposition makes it easy.

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We have purchased the jigs, tools, drawings and can supply immediately parts at less than cost to manufacture.

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motor car parts and service.

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Exclusive Sales Representatives for Manufacturers who supplied Motors, Axles, Wheels, Transmissions, Steering Columns, Control Levers, etc., etc., to the

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Write for prices on parts needed in connection with American cars.

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We maintain a complete stock of parts for the above cars

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New and Second Hand for many makes of cars for sale cheap. Write us when in need of parts.

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top, cover and curtains, etc., \$75.00.
Brand new Ford touring or runabout tops, \$15.00.

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We guarantee them as

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All sizes and makes in stock ready for immediate delivery—At prices that will interest you.

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Cadillac, sedan bodies, new; 50% off.

Limousine, landaulet, cab bodies, \$100 to \$600.
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at 7c a cylinder. KANTKNOCK carbon remover is safe, sure and beneficial. Write for trial offer.
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While visiting New York Show before you buy your supplies we want you to visit us, and get acquainted. We guarantee savings on 60% of your purchases.
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Wholesale only

The Clearing House — continued

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Equipped with

F. & H. Special Wire Wheel Rims

Adaptable to any car. Complete equipment for Ford cars.

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1914 Models—Five-passenger, fully upholstered; fit most any car. Cost \$350.00; our price, while they last, \$85.00. Write for full description.

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You can get complete doors and panels from us at a reasonable price. GET BUSY AND MODERNIZE YOUR CAR. Write for prices. We have all patterns. We also make racing seats, bodies, radiator covers, etc., etc.

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New 5x6 four-cylinder, governor-controlled engine, fully equipped with carburetor magneto. Will sell for much less than cost.

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The \$5.00 Kind for \$2.25 Delivered

Made to fit all models of Ford cars. Extra heavy patent leather lined with heavy thick quilting. Double stitched throughout, reinforced at filler mouth, folding front curtain. We will ship one prepaid to you for \$2.25, and if not equal to any \$5.00 cover on market you may return at our expense. Dealers send \$2.25 for sample and get our prices on dozen lots.

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GUARANTEED RADIATORS

Not always necessary to buy new radiators. New cores can be furnished for frozen or damaged radiators.

We build the fin and tube type. Guaranteed copper fins and tube.

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| Hudson 20 | 25.00 |
| Hudson 33, O. Villac 30..... | 30.00 |
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The above is the price of cores only. Where casings are damaged beyond repair, add \$5.

All our work guaranteed absolutely new—built to your order.

Do not be misled; cores cannot be rebuilt. Write for price on radiators not mentioned in above list.

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253-255 Jefferson Ave.,
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Terms cash with the order.

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You will improve the looks of your car with Seat Covers. We will save you money and give choice of materials.

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1 1910 Cadillac engine and transmission in first-class condition. Price, \$150.00.

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or straight side tires, either firsts or seconds, cheaper than any one in the United States.

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Why pay 20% advance for your repair parts for the old models of MAXWELL cars? We can supply 90% of your wants at the old list price. Transmission gears and parts in stock for Cadillac, Case, Croston, Dorris, Elmore, Moline, Moyer, Overland, Regal, Selden, Stoddard, Velle and 75 others at cut prices. Why pay more? Send for price list.

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Atlanta, Georgia

MORE SPEED FOR THE FORD

Special ratio Differential Gears for the Racy Type Ford.

2½—1 ratio.....\$15.00 Set
3—1 ratio.....15.00 Set
Absolutely interchangeable with the present gearing.

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We can ship immediately every part for every Michigan car no matter what the model.

We purchased and are successors to the Michigan Motor Car Co., and have sole access to all patterns and engineering data. Every part guaranteed to be accurate. Shipment same day order is received.

MICHIGAN MOTOR CAR PARTS CO. Kalamazoo, Michigan

NEVER LEAK PISTON RINGS

(Pat. applied for.) Increase power of motor—prices and circular on request. Cylinders Reground \$4.00 to \$9.00 per cylinder. Interesting proposition for Dealers. Geo. I. Trump Mfg. Co., Crown Point, Ind.

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25 to 50 cents on the Dollar

We are the largest sellers and buyers of manufactured new and second hand bodies in the city of Detroit, home of the Automobile Manufacturers. This is why we have what you want. Write us to-day.

Parts for any Detroit Make of Car.

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Carry your operating license on your key ring in a handy nickel-plated holder. Ready for the traffic cop in an instant. Invest 25c. and save \$25.00. Special Dealers Carton, 1 doz., \$1.75.

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Packard Parts AT DISCOUNT

We carry a Complete Stock

We also have on hand Chalmers 36, E. M. F. Model A, and Regal Transmission Gears. Get our prices on the above. We absolutely save you money. Send us your order to-day.

AUTO PARTS AND ACCESSORIES CO.

1931 BROADWAY, NEW YORK

PRICE WRECKERS

Our new Price Wrecker (catalogue) just printed quotes Dealers' prices on all accessories, motors, transmissions, tops, bodies, windshields, etc. Sent free on request.

A FEW OF OUR BARGAINS:

New Herschel-Spillman Motors 4 and 6 cylinder, \$275.00; other motors, \$65.00 up. \$300 Fore-door touring bodies new, \$85.00. Runabout bodies—1914 Ford new \$35.00, others \$40.00 and \$50.00. Runabout tops \$15.00. Touring \$25.00 (measurement blank sent on request); Racing Seats \$10.00 each. Spicer Universal joints \$1.00 each; mechanical oilers \$4.00 up; windshields \$5.00 up; special nickel 1 piece Rainvision shield \$10.00; Disco self-starter \$5.00; Remy complete dual system magnetos Model R. L. and R. D. \$25.00; others \$5.00 up; Rayfield, Stromberg and Schebler carburetors \$5.00 up; gloves \$1.00 up; Racoon Fur Coats (special bargain) \$18.00, double plush robes \$3.50 each, bulb horns 75c, electric horns complete with wire and button \$1.95, hand horns (mechanical) \$1.50, exhaust horns (all sizes) \$2.50, spark plug pumps \$5.00, double action pumps \$1.75.

SPARK PLUGS:

Special 5 for \$1.00, Mosler 4 for \$1.00, Timesco 3 for \$1.00; Bearings all types \$1.00 up to \$5.00.

SPRING SHOCK ABSORBERS

\$12.50 buys the latest in spring shock absorbers equal to the highest grade on the market selling at \$35.00. Easy to install. On all good cars as regular equipment.

Hartford-Mondex shock absorbers, \$5.00 each; Rims, detachable or demountable, \$2.50 and \$3.00 each; all makes and sizes. Storage batteries, \$6.00; tool boxes, \$1.00 and \$2.00; raincoats, \$1.90; rubber "slip-on" shirts, \$2.50; clocks, \$1.00 up; gas tanks, \$2.50; Prest-O-Lite (genuine) tanks style B, \$12.50 (complete).

LAMPS

Side oil \$3.00 pair, side electric \$2.00 pair, tail oil or electric \$1.15, gas headlights \$5.00 pair (large), electric headlights (large) \$7.00 pair, Gray & Davis large swivel searchlights \$9.00 each.

RADIATORS

ALL MAKES at less than ¼ price. Buick "10" \$19.75; Buick 16/17 \$36.00, Hudson "20" \$29.00, Hudson "33" \$29.00 new. Many others. Radiators repaired or traded in.

FORD

exhaust horns, \$1.65; electric headlights, \$6.00 pair (Gray & Davis). Special Ford Holley carburetor, \$3.50. Set of 4 inclosed spring shock absorbers, \$7.50; master vibrators, \$3.25-\$4.00-\$5.50.

ALSO

300 Well Known High Grade Used Cars

\$150 Up.

Bargains in Motor Trucks

Write for Lists and Information on New Cars—50 Per Cent. Off.

TIMES SQUARE AUTOMOBILE CO.

World's Largest Dealers

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NEW YORK CHICAGO

The Clearing House — continued

HOUPERT QUALITY IN A FORD MOTOR

Does your motor smoke? Do you want to increase your power? Do your pistons slap? Do you really want to bring your motor up to the high standard of the most expensive cars?

\$25.00 Let Us Regrind Your Cylinders \$25.00

and fit new pistons, rings, wrist pins and bushings.

We have the price to interest you and have maintained our quality throughout.

We would never have attempted to do this work if we could not offer you something superior to that obtainable elsewhere. Our whole aim in design and workmanship has been to deliver a product of quality with the working parts as light as is consistent with strength and durability and at a price within the means of the most economical Ford owner.

Don't experiment. Send your cylinders to us and be safe.

See us at Booth D142A at New York Automobile Show

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New York, N. Y.

BUILD YOUR OWN CAR

Here is a new idea—an unusual opportunity for any man who is mechanically inclined to build his own car. You can buy the individual parts such as the motor, transmission, front and rear axles, steering gears, fenders, wheels, bodies, etc., from us at such ridiculously low prices that you can assemble them yourself and save 75 per cent. in the usual cost of a motor car.

We have one of the largest stocks of automobile parts and accessories in the United States and because of our enormous buying power are able to purchase supplies at one-third cost of manufacture.

CAREFUL

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| 6 cyl. Maxwell Motors..... | \$175.00 |
| 5 cyl. Continental Motors..... | 250.00 |
| 4 cyl. Studebaker Motors..... | 120.00 |
| 4 cyl. Warren Motors..... | 175.00 |
| 2 cyl. Randolph truck Motors..... | 60.00 |
| Cutting Transmissions..... | 45.00 |
| Transmission and Multiple Disc Clutch..... | 60.00 |
| Cone Clutches..... | 15.00 |
| Jaycox Steering Gears..... | 8.19 |

TOPS

| | |
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| Maxwell 25 tops..... | 15.00 |
| E. M. F. touring tops..... | 20.00 |
| E. M. F. roadster tops..... | 15.00 |
| Paige tops..... | 15.00 |
| Hup 20 Roadster tops..... | 15.00 |
| Tops for many other cars..... | |

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| 4 cyl. Splittdorf and Remy Magnetos..... | \$10.00 |
| 4 cyl. High Tension Eisemann..... | 25.00 |
| 4 cyl. High Tension Volta..... | 15.00 |
| Bosch Low Tension A. R. H..... | 10.00 |
| 4 cyl. kick switch Splittdorf coils..... | 8.00 |
| 4 cyl. Remy coils..... | 6.00 |
| 4 cyl. Briggs coils..... | 6.00 |
| Kingston Carburetors for Fords..... | 3.00 |
| Kingston Carburetors 1 1/4"..... | 3.95 |
| Rayfield 1 1/2"..... | 12.50 |

ATTENTION

REAR AXLES

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| 3/4 floating Weston Mott..... | 25.00 |
| Full floating Lewis rear..... | 80.00 |
| Full floating Sheldon..... | 50.00 |
| Full floating McCue..... | 65.00 |
| Full floating Weston Mott..... | 75.00 |
| Front axles, complete..... | 10.00 |
| E. M. F. 30 rear axle and transmission..... | 75.00 |

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| Warren Roadster..... | 55.00 |
| E. M. F. Touring, 5 passenger..... | 55.00 |
| Oakland, 5 passenger..... | 60.00 |
| Abbott-Detroit, 7 passenger..... | 60.00 |
| Michigan, unfinished..... | 15.00 |
| Studebaker, 7 passenger..... | 60.00 |

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We are the original repair parts factory. We furnish repair parts for over fifty-three models of cars, such as Warren, Elmore, Marquette, Rainier, Welch-Detroit, Welch-Pontiac, F. A. L., Reliable Dayton, Barnes, DeLuxe, Demot, Michigan, Cutting, Northern, Queen, Wayne, Crow, Anhut, Herreshoff, Henderson, and many others. If you want any part for any auto, write us.

PLEASE

MISCELLANEOUS

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| Fenders—many kinds..... | \$3.00 |
| Wheels..... | 3.00 |
| Dashes..... | .75 |
| Spark Plugs—all sizes..... | .19 |
| Champion X—1/2"..... | .39 |
| Ford and Studebaker floor mats..... | .90 |
| Brake lining, per foot 15c. to..... | .25 |
| Hand-operated Horns..... | 4.00 |
| Electric Horns, complete..... | 2.49 |
| Stewart Speedometers, complete..... | 10.00 |
| Rumble Seats..... | 3.50 |
| Round gasoline tanks, 13 x 30..... | 2.75 |
| Oval gasoline tanks, 15 x 11 x 30..... | 3.00 |
| Pressed Steel Frames..... | 10.00 |
| 17" steering wheels..... | 1.50 |
| 18" steering wheels..... | 2.00 |
| Tool Kits..... | 1.09 |
| Magneto Covers..... | .50 |
| Tire covers—all sizes..... | .75 |
| Radiator compound..... | .50 |
| License Brackets..... | .35 |
| Ford oil gauges..... | .35 |
| Ford dash Primers..... | 1.20 |
| Ford Radiator and Hood covers—Complete set..... | 2.98 |
| Radiators for all cars at a price..... | |

FORD DEMOUNTABLE WHEELS

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| 4—30 x 3 1/2 Demountable wheels..... | |
| 5—30 x 3 1/2 Demountable rims—Complete set for..... | \$22.00 |

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Send for our catalogue and Bargain Bulletins. They are free and show the most startling prices ever quoted on automobile parts and accessories

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Please mention The Automobile when writing to Advertisers

The Clearing House — continued

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Owing to our increased Manufacturing Facilities, due to the excessive demand for Speedometer parts from us, we are now in a position to sell Stewart Speedometer and other make speedometer parts at a big reduction to you.

| | Old list price | Our new price | | Old list price | Our new price |
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| Swivel Joints | \$4.00 | \$2.00 | Pinion or small gears..... | \$0.75 | \$0.15 |
| Flexible shafts, complete..... | 5.00 | 2.00 | Attaching Clamps, complete..... | 1.50 | .75 |
| Flexible shaft casings..... | 3.00 | 1.00 | Rubber Fender Washers..... | .25 | .10 |
| Inside chains, complete..... | 2.00 | 1.00 | Brass Footboard Collars..... | .25 | .10 |
| Upper End Clutch on chain..... | .20 | .05 | Strap for Shafts..... | .25 | .10 |
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| Road Wheel gear, complete..... | 1.50 | .75 | Flexible Chains (per ft.)..... | .50 | .15 |
| Washers and screws for gears.... | .25 | .10 | Stewart Shaft Lubricant (Can).. | .50 | .15 |
| | | | Flexible shaft ferrule and union.. | .30 | .15 |

These prices apply on Stewart parts only.

\$175.00 WORTH OF PARTS FOR \$100.00

Dealers making up an order of parts amounting to \$175.00 at list prices can purchase same for \$100.00.

PINIONS—purchased in lots of 20—\$2.00.

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NON-SKIDS
15%EXTRA

AKRON TIRES

PROMPT
SHIPMENTS

GUARANTEED

AKRON TIRES ARE FAMOUS

| Size | Tires | Tubes | Size | Tires | Tubes |
|--------------|--------|--------|--------------|---------|--------|
| 28 x 3..... | \$6.00 | \$1.90 | 34 x 4..... | \$12.75 | \$3.65 |
| 30 x 3..... | 6.40 | 2.00 | 35 x 4..... | 13.40 | 3.75 |
| 30 x 3½..... | 8.00 | 2.40 | 36 x 4..... | 14.30 | 3.80 |
| 31 x 3½..... | 8.80 | 2.60 | 34 x 4½..... | 15.95 | 4.30 |
| 32 x 3½..... | 9.55 | 2.65 | 35 x 4½..... | 16.40 | 4.35 |
| 34 x 3½..... | 9.75 | 2.80 | 36 x 4½..... | 16.70 | 4.50 |
| 30 x 4..... | 10.20 | 3.25 | 37 x 4½..... | 18.30 | 4.65 |
| 31 x 4..... | 10.70 | 3.30 | 35 x 5..... | 18.30 | 4.75 |
| 32 x 4..... | 11.10 | 3.40 | 36 x 5..... | 19.10 | 4.95 |
| 33 x 4..... | 11.90 | 3.50 | 37 x 5..... | 19.80 | 5.10 |

Guaranteed Tires YOU SAVE MONEY Low Prices

On C. O. D. orders 10 per cent. deposit required

AKRON TIRE COMPANY, Inc.

Authorized Capital, \$300,000.00

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Save \$25 to \$75 by doing the work at home with the Arsenal System. Our big free booklet, "The Car Beautiful," tells how. Send for it today.

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PROTECT YOUR CAR
from Joy-Riders and Thieves by using our Nickle Plated Utility Auto Lock, also protects your Robe and Radiator Cover.
Valier Specialty Co.,
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Racing Bodies and Bucket Seats
GET OUR CIRCULAR
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RADIATOR BARGAINS
Ford Model T Tubular.....\$16.00
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Buick 16 and 17.....28.50
Buick 10.....20.00
Hudson 20, 32 and 33.....28.50
Chalmers 30.....30.00
Everett 30 tubular.....14.00
Write for prices on any other makes.

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1436-38 So. Michigan Ave. Chicago, Ill.

RADIATORS

| WHILE THE STOCK LASTS | | |
|-----------------------|----------|---------|
| Name. | Model. | Price. |
| Brush | All Mod. | \$10.00 |
| E. M. F. | 30 | 15.00 |
| American | 30 | 20.00 |
| American | 34 | 21.00 |
| Krit | 56 | 22.00 |
| Nyberg | All Mod. | 18.00 |
| Nyberg | 4-Cy. | 20.00 |
| Nyberg | 6-Cy. | 22.00 |
| Westcott | 6-Cy. | 20.00 |
| Stoddard-Dayton | All Mod. | 20.00 |

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Do You Want Our Big General Catalogue?
It's Yours for the Asking

Radiator—"THE CONSERVATOR"—Protector
(Pat. Pend.)
The only scientifically designed radiator protector on the market. Write for literature. Dealers take note. Made for all cars. Ford special \$1.50.
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Here's a Big Opportunity

That every live FORD OWNER Should
TAKE ADVANTAGE OF
NOW IS THE TIME TO BUY YOUR
FORD EQUIPMENT.

Send today for our prices on Ford Regular and V Shape Radiators, Demountable Rims, Master Vibrators, Cowl Dash and Windshields.
We sell only standard and guaranteed goods.

We manufacture a complete line of GUARANTEED FORD ACCESSORIES, our goods are absolutely perfect in every detail, and never fail to satisfy the most skeptical.

Don't forget! We sell everything for the Ford car. Tell us your wants now! Or send us your order today.

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slightly used, as good as new, for shop use. A great bargain.
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YEAR-END SPECIAL SALE

WINDSHIELDS

Any size; straight, zig-zag or Rain Vision Ventilating Types. Complete with rods, connections and filler board. Brand New at.....\$6.00

SPEEDOMETERS

Stewart Model 100 complete Reg. \$12 at \$6.75
Stewart Model 102 complete Reg. \$25 at \$9.75

HORNS

Stewart Hand Horn Reg. \$5.00 at.....\$4.25
Samson Jr. Motor Horn Reg. \$10.00 at \$6.35

CLOCKS

Stewart-Warner eight-day, rim-wind. \$3.75

SEND FOR CATALOGUE ON
FORD SPECIALTIES.

ERWIN GREER & COMPANY,
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A. A. A.

SCORED CYLINDERS

We fill your deep scored cylinders with a silver composition by our patented electric filling process. Remember! We also do a large welding business.

L. LAWRENCE & CO.
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Cylinder Grinding—The Better Quality
Perfectly balanced motors guaranteed with our re-grinding and new pistons. Scored cylinders filled and reground. Welding repairs of all descriptions. "Send it to Oxy." **Oxy-Carbide Company**
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Pistons and Tight Rings Furnished

General overhauling, crankshafts manufactured, Quality Guaranteed. Prices interesting.

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CYLINDER REBORED

Including Piston and Rings \$7.00 to \$11.00

Sterling Engine Co.,
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CYLINDERS REBORED

Best quality pistons and rings fitted. Any make or size. \$3.00 and up.

Kenney Colwell Co.,
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GRIND YOUR VALVES.—The American valve
facing and seating tools are instantly adjustable to any automobile, motorcycle or truck; price \$10; complete set of two tools; C. O. D. express or parcel post; privilege of examination. **THE AMERICAN VALVE TOOL CO., Stamford, Conn.**

Have Your Cylinders Rebored and Reground

Fitted with my racing pistons and my new patent leakless rings. Guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.

McCadden Machine Works
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MAGNETOS REPAIRED BY A MAGNETO SPECIALIST

Expert on Bosch, Elsemann, Remy. Magnetos bought, sold, installed and repaired at short notice. Agent for N. Y. Coil Co.

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256 Halsey Street, Newark, N. J.

NEW GERMAN PROCESS OF SOLDERING ALUMINUM

We don't weld Aluminum anymore. We solder it by the new German Process under guarantee. No warping of the castings, and they are twice as strong. Prices much lower.

A trial will convince you.

LUDLOW AUTO ENGINEERING CO.
3435 Ludlow St., Philadelphia, Pa.
LIVE AGENTS WANTED TO SELL SOLDER
OUTSIDE PHILA.

TO GARAGE AND REPAIR MEN

Motor car owners are demanding that their cylinders be re-ground and fitted with new pistons and rings. Are you in a position to accommodate them? If not, attach an

ACME CYLINDER GRINDER

to your lathe and get this business. There is money in it for you.

We also re-grind cylinders and fit them with new pistons and rings.

Liberal discounts to you on this work.

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We Apply and Carry in Stock
all makes Demountable Rims, Demountable Equipment for Maxwell Cars. \$30.00 complete set.

Twining Bros.
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WE REGRIND CYLINDERS

furnish our heat-treated piston rings and pistons. First-class equipment; 15 years' experience. Write for our prices.

Bridgeport Piston Ring Co.,
Bridgeport, Conn.

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| 30x3 | 5.00 | 5.50 | 32x4 1/2 | 9.00 | 10.00 |
| 30x3 1/2 | 6.00 | 6.50 | 34x4 1/2 | 10.00 | 11.00 |
| 32x3 1/2 | 6.50 | 7.00 | 35x4 1/2 | 10.00 | 11.00 |
| 34x3 1/2 | 7.50 | 8.00 | 36x4 1/2 | 10.00 | 11.00 |
| 30x4 | 7.00 | 7.50 | 37x4 1/2 | 11.00 | 12.00 |
| 32x4 | 8.00 | 8.50 | 34x5 | 10.00 | 11.00 |
| 33x4 | 8.00 | 9.00 | 35x5 | 12.00 | 13.00 |
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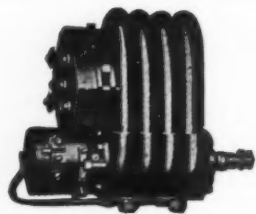
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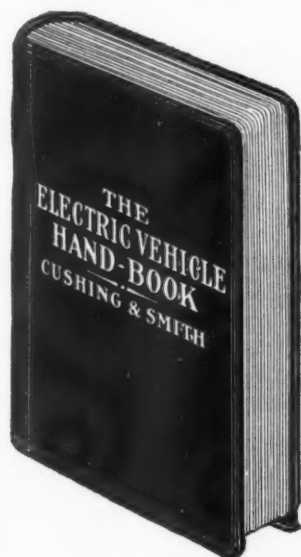
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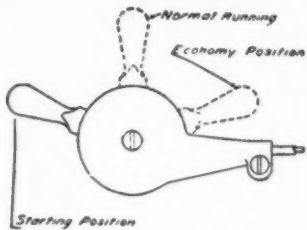
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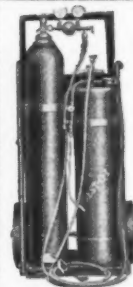
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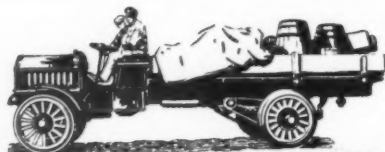
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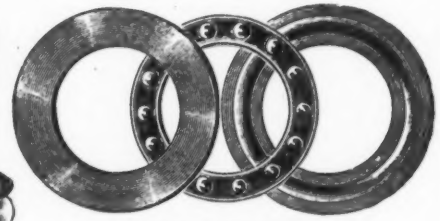
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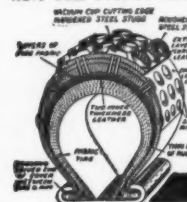
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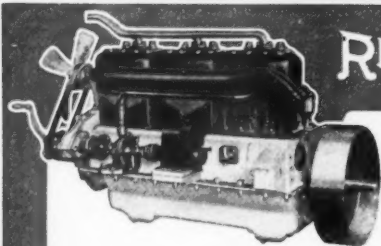
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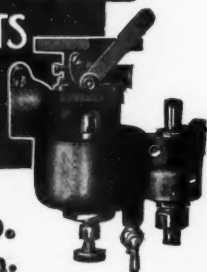
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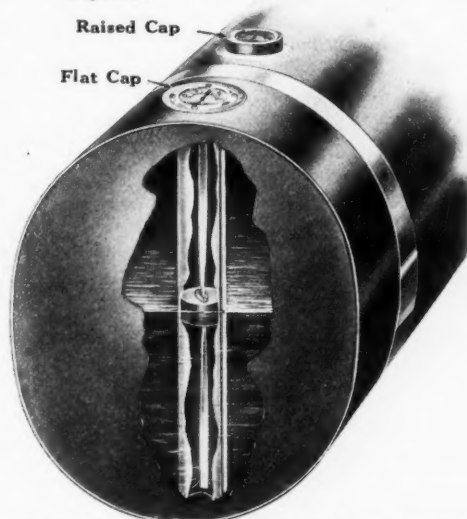
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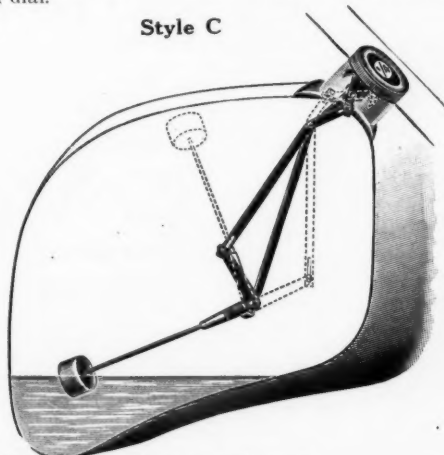
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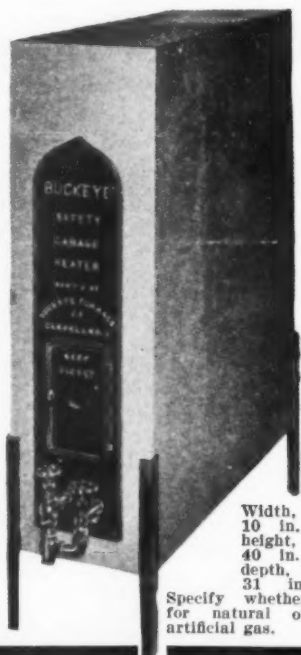
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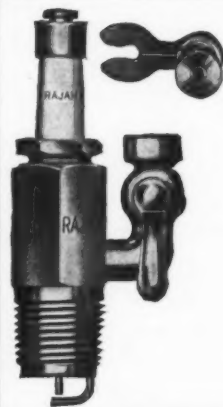
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are absolutely dependable in locating trouble in starting and lighting systems, or proving its absence. Built to conform in every way with the exacting Weston standard, they are accurate, serviceable, reliable, yet inexpensive. Write for special booklet describing Model 280.

WESTON ELECTRICAL INSTRUMENT CO., NEWARK, N. J.



RAJAH PRIMING PLUG

Not an untried experiment but a PLUG that will give universal satisfaction. Made by a manufacturer whose product has been recognized as the standard for over ten years. Take advantage of this experience. Let us send you a catalog and give you further information.

Order from your dealer or remit direct to us.

\$1.50 Postpaid with Terminal

RAJAH AUTO-SUPPLY COMPANY
Bloomfield, N. J.

John Millen & Son, Limited
Montreal, Toronto, Vancouver, Winnipeg



Hyatt Quiet Bearings

HYATT SERVICE STATIONS

Atlanta, Ga. Detroit, Mich.
Boston, Mass. Los Angeles, Cal.
Chicago, Ill. New York,
(Harrison, N. J.)

SERVICE AGENTS

Hyatt Quiet Bearings are used in the majority of American made Automobiles

High Wycombe, England
Broom & Wade
Minneapolis, Minn.
Pence Automobile Co.

HYATT ROLLER BEARING CO.
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HOUK Detachable WIRE WHEELS

"The wheel that makes any car modern"

George W. Houk Company, 1701 Elmwood Ave.
Buffalo, N. Y.
Also Broadway and 58th Street, New York City

HessteelElectric and
Crucible Steel(Processes recognized as best for highest quality with
most uniformity)BLOOMS—BLANKS—BARS—CASTINGS of any
essential analyses or alloy.Our CAST WROUGHT IRON CASEHARDEN-
ING BOXES are saving money. Carried in stock.The Hess Steel Company
Bridgeton, New JerseyHANG ON TO YOUR OLD TIRES
THEY CAN BE USED FOREVER
WHEN COVERED WITH
STEELThe Kimball Steel Protector makes Blow
Outs, Punctures and Rim Cuts impossible. A
few sections will hold any old blowout. Tires are
as flexible as ever. Send for detailed information.
KIMBALL TIRE CASE CO., 171 Broadway, Council Bluffs, Iowa.PENNSYLVANIA
Oilproof
VACUUM CUP TIRESMaking their
mark everywhereGuaranteed for
4500 milesPennsylvania
Rubber Company
Jeannette, Pa.THINK THOUSANDS OF MILES
AHEAD, AND YOU WILL BUY
REPUBLIC MILEAGE
PLAIN AND STAGGARD TREAD
TIRESTHE REPUBLIC RUBBER CO.
YOUNGSTOWN, OHIO.

BRANCHES AND AGENCIES IN THE PRINCIPAL CITIES.

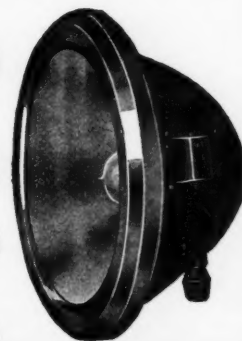
SEE IT AT THE SHOWS

TRADE MARK
NON-FLUID OIL
REGISTERED IN
UNITED STATES PATENT OFFICEis a specific product of our exclusive manu-
facture perfected and designed for the lubri-
cation of automobiles—and for this use it is
far superior to any other—barring none.
Used instead of LIQUID oils, or greases, it
will make your car more efficient, minimize
your repairs, and decrease your lubrication
bills. No matter what lubricant you now use
NON-FLUID OIL will lubricate BETTER
and MORE ECONOMICALLY—as a comparison will prove. Try it
on your own car, under your own conditions and note the results."K. No. 00 Special" grade for sliding gear transmission
"K. No. 000" for differential, compression cups and all bearings.Sold by leading dealers everywhere. Look for the orange-colored
can bearing sprocket-wheel trade-mark shown above

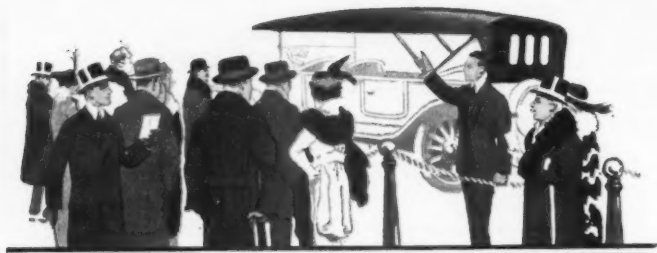
New York & New Jersey Lubricant Co.

165 Broadway, New York

1430 Michigan Ave., Chicago, Ill.

"SAFETY FIRST"
IS
ASSURED
IN
E & J LAMPSThe EDMUNDS & JONES
MANUFACTURING CO.
ILLUMINATING ENGINEERS
DETROIT MICH.**SALISBURY**AXLES WHEELS
PROPELLERSSalisbury Wheel
& Mfg. Co.
JAMESTOWN, N.Y.

Please mention The Automobile when writing to Advertisers



A TOP material that leaks is EXASPERATING; a Top material that gets shabby is HUMILIATING—in fact any kind of a Top material except one that *protects* and wears, you would classify as so much RUBBISH.

AT THE SHOW

ASK THE

Automobile Salesmen these questions:

1. What Top material is used on your car?

If it's genuine Pantasote you are getting the greatest possible value.

Pantasote

If it is *not* genuine Pantasote—then—

2. Ask if it has a direct-to-owner guarantee backed by an old established Company whose responsibility and quality of product are *known*?
3. Ask the salesman *who makes it*? Get the *NAME*.
4. Ask him what his Top material is made of?
5. Ask whether it is guaranteed against injury by oil and grease?
6. Ask if strong sunlight and extreme temperatures and climatic conditions affect it?
7. Ask the salesman if it is *permanently waterproof*?
8. Ask if dirt and dust can be removed without the use of a ruinous cleaning liquid?

As a matter of fact—Pantasote is the one Top material which has not become a victim of wild competition, which invariably means price-cutting, and, more important, *quality-cutting*.

Genuine Pantasote is used on quality-cars (such as the Pierce-Arrow, Marmon, Stevens Duryea, Hudson, Cole, Chandler, etc.) because its first cost is justified by the *service* which the owner gets out of his Top. It not only gives him the greatest *mileage*—but it keeps looking fresh and new during its entire length of service.



CAUTION—In purchasing an automobile Top look for this label. It's your safest protection. There are cheap surface coated Top materials which look like Pantasote (but only when they are new). Substitution is frequently practised by unscrupulous dealers to increase their profits at the purchaser's expense. Labels like this are sent out free with every shipment of Pantasote. The Top maker has no excuse for not using them on Pantasote Tops.

"What's What in Top Materials" is a 24-page treatise on the general subject of Top materials. It is sent without charge on request and gives you an insight into the Top material question which does not show on the surface.

Every Top looks well when it's new—there are a number of reasons why Pantasote keeps looking new after it has actually been "on the road." Send for this booklet today.

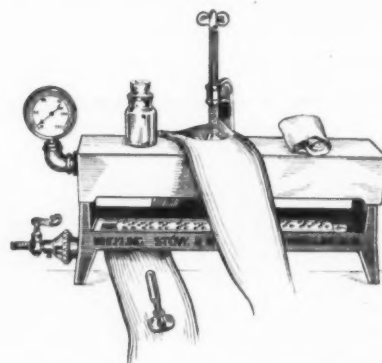
THE PANTASOTE COMPANY

21 Bowling Green Building

New York, N. Y.

At Last A Successful Steam Vulcanizer

CAPACITY, 16 inner tubes per hour
Vulcanizing plate 16" x 4½"



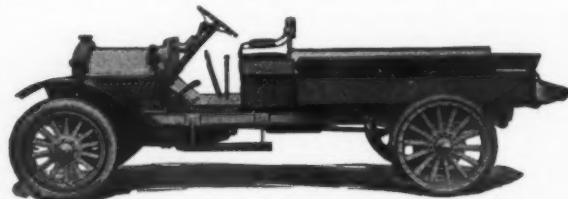
Wheeling No. 2, Artificial or Natural Gas
Price, \$12.00

WHEELING STOVE & RANGE COMPANY
WHEELING, W. VIRGINIA



A RECORD

3500 miles over average roads in seven states, carrying a load of 2000 pounds, with an average of 14.7 miles per gallon, an oil consumption of 1.5 pints per hundred miles, and a total of \$2.73 for repairs.



| | | |
|---------------|-------|-------------------|
| Chassis | ¾ Ton | With EXPRESS Body |
| \$1290 | | \$1350 |

Dealers who can properly handle the best selling commercial vehicle of its class should investigate. Details of this remarkable record and agency proposition on request.

SANFORD MOTOR TRUCK COMPANY
Syracuse, New York

SAFETY IS TOO DEAR TO BECOME YOUR STAKE IN A GAMBLE

Just as good brake lining as Raybestos does not exist—
neither in quality of materials and honesty of work-
manship, nor in efficiency and duration of service

THE QUALITY OF RAYBESTOS IS WORTH WHILE
Raybestos is the product of Brake Specialists.



TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"
It Stands The Test

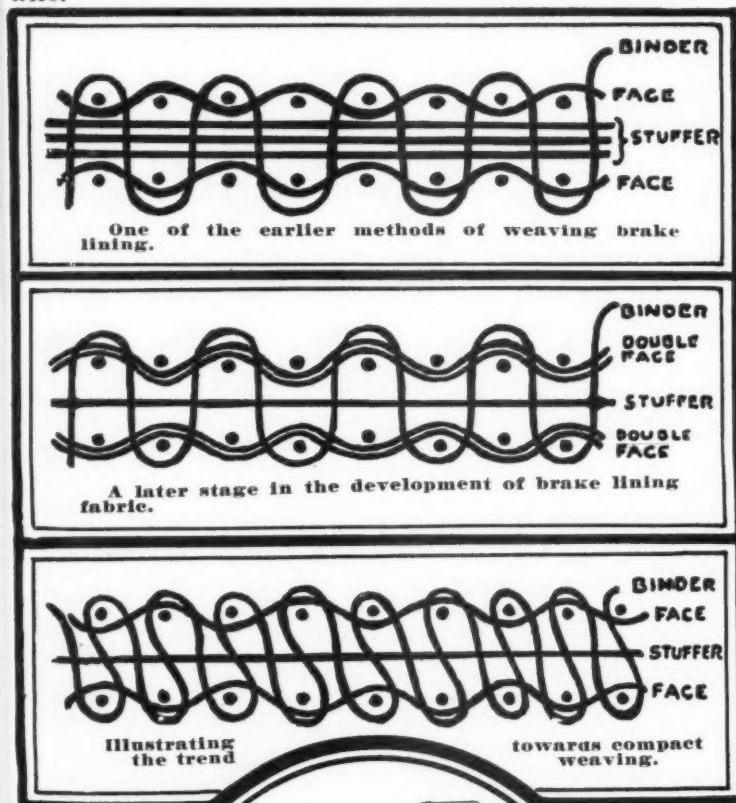
Raybestos is backed by a guarantee
of perfect service for one year from
the date it is put on a car.

Manufactured by
The Royal Equipment Co.
1380 Bostwick Avenue
Bridgeport, Connecticut

*Insist on getting the kind with the silver
edges. Sold by all leading dealers.*



RAYBESTOS is—and always has been—made of the highest quality of long fibre asbestos spun in the form of yarn around wire.



The diagrams above show some of the methods used, since discarded by us, in the development work of which RAYBESTOS is the result. Special looms built to our own design now weave the fabric we have trade-marked RAYBESTOS. So far competition has been unable to copy it.



Raybestos

The PRODUCT of BRAKE

Sold by nearly every
mobiles or automobile

You will know it by its silvered edge
on every foot of it, distinguishes RAY

*RAYBESTOS is the
product of brake
specialists*

Our first activity as manu-
facturers was in the design,
development and production of
automobile brakes and brake mechanism.

During our whole business career we never have been
guilty of producing a brake mechanism which our experi-
ence told us was not what it should be.

This same thoroughness is characteristic of our brake
lining business. We never have taken a short cut to for-
tune if it involved the slightest chance of sacrificing the
quality of our product.

No other concern in this country making brake linings
has ever designed or produced brakes or brake mechanisms,
and their knowledge of the problem they are undertaking
to solve in the production of brake lining is not founded
on nearly so practical a basis as that which underlies the
design, development and manufacture of RAYBESTOS.

For this reason you should insist on RAYBESTOS.

Raybestos is the Product

GUARANTEE If
from
furnish new lining without charge. ::
weights of pleasure cars and to all light

Bestos

Brake Specialists



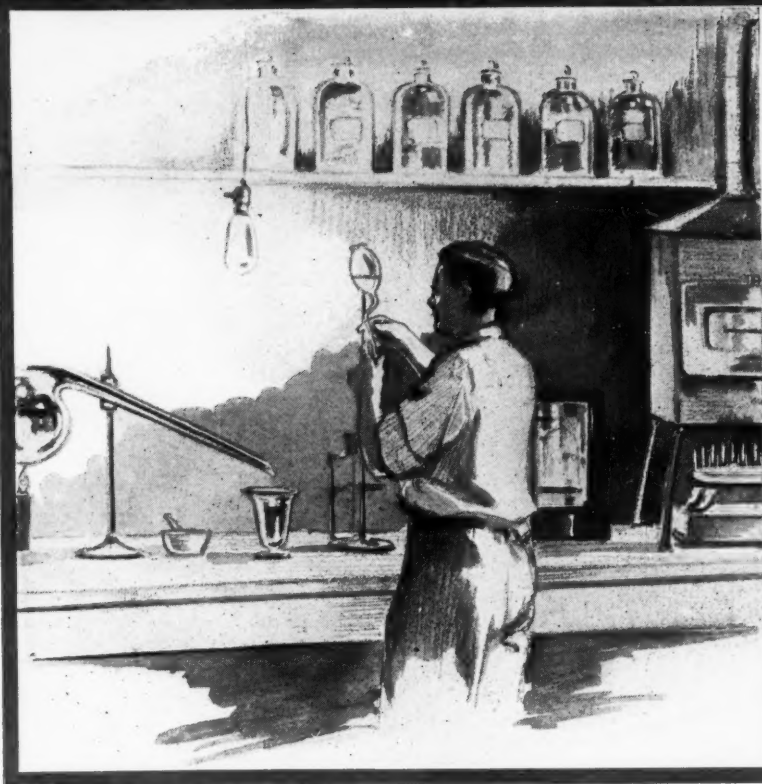
leading dealer in auto-supplies.

s. This, and our trade-mark stamped BESTOS from the ordinary kind

The efficiency of RAYBESTOS as a brake lining is beyond question

The most unfair competition cannot find a single weakness in it. Every strand in RAYBESTOS is woven and interlocked, one with another, into a homogeneous fabric of great tensile strength and solidity. With our improved machinery we attain a remarkably even thickness, which insures the uniformity of grip so necessary to the successful operation of automobile brake mechanism.

The most severe test any brake lining can get comes with its use on Motor Fire Apparatus. Fire Engines, Ladders, Chemicals, Hose Wagons, Patrols, etc., average in weight as much as the ordinary truck and far more than the heavy types of pleasure cars. They travel at a speed higher than ordinarily is attained by either trucks or pleasure cars. Fast runs with quick application of brakes for turning street corners and stopping are characteristic of their every-day usage. It is significant that nine out of ten motor fire vehicles of one kind or another in the United States are equipped with RAYBESTOS. This service is extraordinary, but there is no detail of an automobile which should be provided with any greater factor of safety than the brake mechanisms. No brake is any better than its lining.



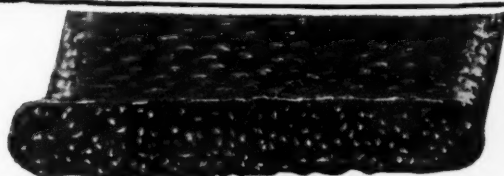
Successive stages of treatment which led up to the thorough impregnation of RAYBESTOS with our famous heat and wear resisting compound.



First or surface treatment discarded by us years ago.



Partial impregnation—one stage in the effort to attain complete impregnation—discarded by us when the result shown below was accomplished.

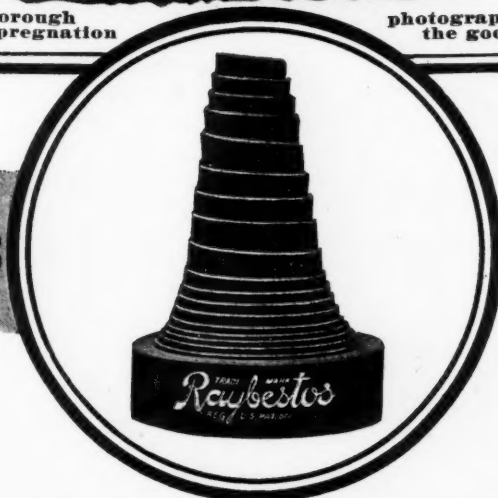


Thorough impregnation

photograph from the goods.

Product of Brake Specialists

RAYBESTOS fails to last one full year the time it is placed on the car, we will This Guarantee applies to all types and trucks.



The chemical treatment of RAYBESTOS is the really important factor which enables us to guarantee unqualified service from RAYBESTOS for one full year from the date it is put on the car. In spite of this superior service we are constantly experimenting to improve our treatments.

How to Get the Bulk of the Brake Lining Business



**To
Dealers:**

Sell the Brake Lining you would buy yourself.

If you follow this plan you will build up a better business and make more money in the end.

Look at it from your customers' standpoint. They know that the quality of RAYBESTOS is supreme. They know that its service is superior to that of any other brake lining. They know that it is backed by the most comprehensive guarantee ever given any brake lining.

These factors are more potent in swinging the bulk of the brake lining business to you than any other consideration.

Getting the benefit of the prestige, quality and service of RAYBESTOS to help build up your business is worth far more to you than a little longer discount on some other brand of brake lining. Longer discounts are aimed to attract you.

Your customers do not benefit.

You cannot give them any better quality—nor more attractive prices. Service in a brake lining is what they want. Service and a cut price never yet went hand in hand. The quality—the prestige—and our business-like methods of distributing RAYBESTOS constitute too much of an asset to you for you to be tempted by smart selling methods.

RAYBESTOS discounts are fixed—the same to each and

every dealer. We believe in a square deal for everybody and we treat everybody exactly alike.

Quality is put into RAYBESTOS to insure service. The service of RAYBESTOS is definitely guaranteed. In every big city in this country there is a good, reliable concern which carries a complete stock of RAYBESTOS, ready to supply your needs on telephoned, telegraphed or written order. Any one of these concerns will quote our standard discounts to the trade—their discounts are the same as we would quote you direct. Their nearness to you, and their ability to make immediate deliveries of either large or small quantities makes it unnecessary for you to carry more than an easily handled stock for your immediate requirements.

THE ROYAL EQUIPMENT COMPANY
1354 BOSTWICK AVENUE :: BRIDGEPORT, CONNECTICUT

What **GOULD**
Vehicle Batteries
are doing

Gould

GET THIS BOOKLET

The actual performance records cited therein form a good basis for judging whether a given battery is carrying as heavy loads, making as long runs and lasting as well as it should.

A careful reading should therefore prove instructive and probably of actual money value to all using or selling electric pleasure or commercial vehicle batteries.

Ask for your copy and if in the market for battery renewals, let us tell you exactly what service improvements a Gould Battery would accomplish in your own case.

Gould renewals fit any jars.

Gould Storage Battery Co.

General Offices: 30 East 42nd Street, New York City
WORKS: Depew, New York

Boston, 14-16 Cambria St.

Philadelphia, 613 Betz Bldg.

Cleveland, 1761-5 E. 18th St.

Detroit, Kerr Bldg.

Chicago, 225 E. 22nd St.

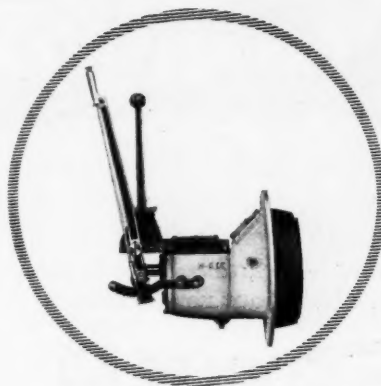
San Francisco, 1448 Van Ness Ave.

Los Angeles, 110 E. Pico St.

Agents in Washington, Rochester, Buffalo, Pittsburgh, Milwaukee, Minneapolis, St. Louis, Kansas City, Omaha, Denver, Topeka, Seattle. Canadian Representative: R. E. T. Pringle.
Toronto, Montreal, Winnipeg and Vancouver.

118

"The Recognized Standard"



THE WARNER GEAR COMPANY WILL OCCUPY SPACE NUMBER C31 AT THE GRAND CENTRAL PALACE DURING THE NEW YORK SHOW. SOMETHING CAN BE LEARNED FROM EVERY ITEM IN THE EXHIBIT BY BOTH THE CAR MANUFACTURER AND THE PUBLIC.

LEADING MANUFACTURERS OF

TRANSMISSIONS
STEERING GEARS
DIFFERENTIALS
CLUTCHES

WARNER GEAR COMPANY

MUNCIE, IND.



These little open cuts leave the fabric exposed. *Blow-outs* result, and expensive repairs. Vulcanize these small holes. Seal them up with a Shaler Vulcanizer. Triple your mileage and save half your repair bills.

SHALER Vulcanizer

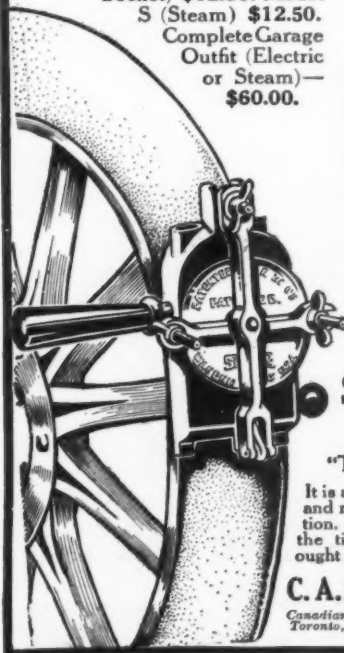
A Shaler Vulcanizer will repair any puncture, cut, hole, or tear in casing or tube perfectly and permanently. Has automatic heat control. No danger of undercuring or overcuring.

The Shaler Vulcanizer is the successful result of years of work to make perfect repairs on pneumatic tires by vulcanization.

The Shaler Vulcanizer is recognized as standard. In the big garages and best repair shops throughout the country Shaler Vulcanizers are in use.

We are the world's largest makers of vulcanizers and make the only complete line.

We make Shaler Vulcanizers in every type—Electric, Steam, Gasoline and Alcohol. Shaler Vul-Kit (Gasoline) at \$3.50. Shaler Tube-Kit, \$2.00. Model D (operates from Electric Light Socket) \$12.50. Model S (Steam) \$12.50. Complete Garage Outfit (Electric or Steam)—\$60.00.



Vul-Kit \$3.50

Can be carried in the tool box for emergency repairs. Does away with patches and cement. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. No watching, no regulating; simply fill the cut with new rubber, clamp on the vulcanizer—fill and light the generator. Can't overcure or undercure. Handle always cool. Anyone can use it. Complete, \$3.50.

Send for Catalog and Free Book

"The Care and Repair of Tires."

It is a guide and text book on the care and repair of tires. Tells the proper inflation. It describes fully how to protect the tires. It explains everything you ought to know about tires.

C. A. SHALER CO., 100 Fourth St., WAUPUN, WIS.
Canadian Distributors—John Miller & Son, Limited,
Toronto, Winnipeg, Montreal, Vancouver, Victoria

HIGH and
LOW TENSION
MAGNETOS



MASTER VIBRATORS
ROAD SMOOTHERS
AUTO LOCKS

Don't Use Imitation Springs and
Contact Points in Your



MASTER VIBRATOR

K-W Master Vibrator owners are warned against the use of imitation springs and contact points on their Master Vibrators as these positively will not work. For your protection all K-W points are put up in sealed envelopes, sealed with a label bearing our registered trade-mark. Look for this K-W seal label and the K-W Trade-Mark that is stamped on the top of the "T" shaped bridge.

When replacing contacts use complete new springs. Do not solder new contacts to old springs as solder destroys the contact and the spring itself will become bent and the cushion effect destroyed. The contact points on K-W Master Vibrators are large and are made of genuine platinum iridium, a material that costs three times as much as pure gold. Make sure you get the genuine with the K-W trade-mark. Price \$3 per pair.

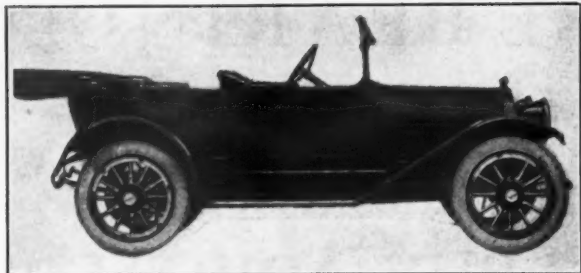
In buying your Master Vibrator be sure you get a K-W. Look for the K-W trade-mark and the serial guarantee number. They protect you against imitations. If your dealer can't supply you we will send one direct, postpaid, on receipt of price. Write for "That Satisfied Feeling Folder."

HEADLIGHTING
OUTFITS

THE K-W IGNITION CO.
2833 CLEVELAND ST.
CLEVELAND, OHIO, U.S.A.

SPARK COILS
SPARK PLUGS

EXTRA! \$1500 Brand
New 1915
Touring Cars } at \$875
and Roadsters }



THIS IS THE CAR

If we could advertise the manufacturer's name we could demand a much higher price. The name plate of the manufacturer appears on the radiator.

CATALOG AND NAME GIVEN ON REQUEST

This car has never before been sold for less than list price. It is a well-known standard make. Thousands of these cars are now in use.

Electric Starter and Lights

Motor, 4-cylinder, 4 1/4-inch bore by 5 1/4 stroke, three-point suspension with power plant, ignition, magneto, dual system, carburetor, Stromberg, transmission 3 speeds, center control, right and left hand drive, full floating rear, 3 1/2 x 4-inch tires, demountable rims, Goodyear no-rim-cut tires, 11 1/4-inch wheel base.

Equipment

In addition to Electric Starter and Lights, each car is equipped with: Silk Mohair Top, with curtains and dust cover; Rain Vision, two-piece windshield; Speedometer; combined single and double Tire Holders; Electric Light Dimmer; Electric Horn; Robe Rail; Foot Rail; Tire Repair Outfit; Demountable Rims, with extra rim; Tool Outfit; Speedometer Light; Lock Switch; Nickel Finish.

These cars were ordered for export, but owing to demoralized transportation facilities could not be shipped, making it possible for us to buy the entire order for Spot Cash.

We Have Only a Limited Number, So Act Quick. Cars Now On Our Salesfloors.

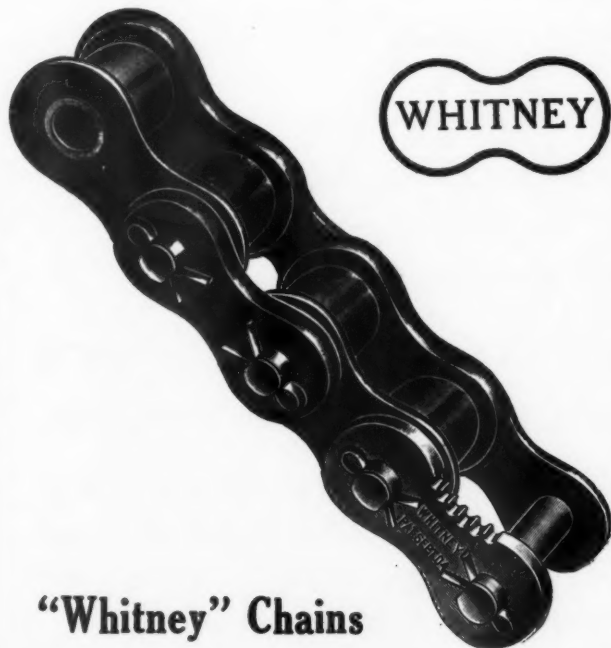
The manufacturers of these cars are in a healthy financial condition and can furnish parts at any time. Every car sold with a guarantee.

We Will Ship You This Car On Receipt of Deposit to Cover Freight Charges, with Privilege of Inspection.

GORSON'S AUTOMOBILE EXCHANGE

238-40 N. Broad Street
AGENTS WANTED

Philadelphia, Pa.
WRITE FOR CATALOG



"Whitney" Chains

Made by specialists in the foremost organization for chain design and manufacture in America. Our aim is dependability of service under hardest conditions, and our success in this is shown by the standardization of "Whitney" Chains by the leading motor truck makers of the country.

THE WHITNEY MFG. CO.
HARTFORD, CONN.

No War Prices ON GAULOIS TIRES

Shipments of GAULOIS
Tires continue to arrive
from Havre and Marseilles
as in the past.

No fear as to deliveries
need be felt.

We can supply you in all
sizes and styles.

If you have never tried
GAULOIS TIRES
now is the time to do so.

**THEY LOOK BETTER
THEY WEAR BETTER
THEY ARE BETTER**

Gaulois Tire Corp.
49 West 64th St., New York





FAFNIR BALL BEARINGS

MADE IN AMERICA
SOLD DIRECT FROM FACTORY
DELIVERIES ASSURED

WHY BUY ABROAD?

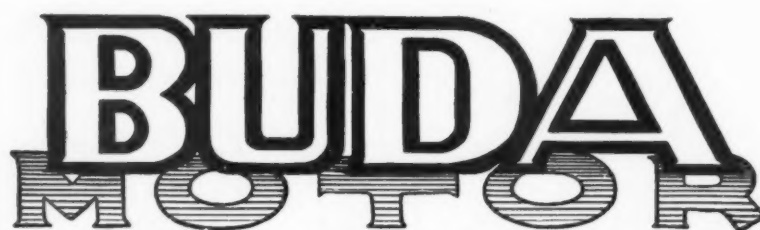
ABSOLUTE INTERCHANGEABILITY

MORE SILENT than the "MOST SILENT"

CLOSEST POSSIBLE LIMITS MAINTAINED AND GUARANTEED

SUBMIT YOUR ENGINEERING PROBLEMS. WE ARE IN POSITION TO GIVE YOU
ENTIRE SATISFACTION. NEW EDITION OF CATALOG READY FOR MAILING.

The FAFNIR BEARING COMPANY, New Britain, Conn.



"The part that sells the car"

**has taken contracts away from competitors
at higher prices, at lower prices, at equal prices.**

Because, on scientific **laboratory** tests, on **factory** tests, on practical **road** tests, on the test of the **sales floor**, and on the greatest test of all — long years of **use** — BUDA Motor shows the good qualities that only the best can have.

See the Latest BUDAS at the Automobile Show

NEW YORK:
January 2—9, Space C-77
Third Floor
Grand Central Palace

1108 S. MICHIGAN AVE., CHICAGO

THE BUDA COMPANY

FACTORY, HARVEY, ILL., (Chicago Suburb)
Address all correspondence to our **FACTORY REPRESENTATIVES**
BRANDENBURG & COMPANY

1311 DIME BANK BLDG., DETROIT

CHICAGO:

January 23—30, Space 34
Gallery
Coliseum

57TH & BROADWAY, NEW YORK CITY





No. 200. Combination Cigar Lighter and Lamp. Complete with holder. Price, \$3.50



No. 281. "Presto" Inspection Lamp. Full reflector, 3-in. diameter, nickel-plated, highly polished, 10-ft. cord, regular battery terminals, 6-volt, 2-c. p. bulb. Price, \$1.00
No. 286. Same, 3-in. lens. \$1.25



No. 204. "Presto Ford" Cigar Lighter. Designed especially for the Ford car. Complete with holder. Price, \$2.50
No. 205. "Presto Star" Cigar Lighter. For other cars. \$2.50



No. 230. Combination Dash and Trouble Lamp. Complete with 10 ft. of cotton cord, and 6-volt, 2-c. p. Tungsten Edi-Swan base bulb. Price, \$2.00
No. 235. Special for Ford cars. \$2.00

Every motorist needs "Presto" Specialties. The best equipped cars carry our Cigar lighters, Inspection lamps, Hand lamps, Dash lamps, and Combination Dash and Inspection lamps. The complete line is built as perfectly as we know how and guaranteed for service.

"Presto" Cigar Lighters have pure platinum lighter tips. They last; others don't.

DEALERS:—Add these Presto Accessories to your catalogue and stock them. You will find them winners from a profit standpoint. They sell easily, don't conflict with your other lines and carry a generous margin of profit for you. Write today for terms.

METAL SPECIALTIES MFG. COMPANY
 736-738 W. Monroe Street, Chicago, Ill.
 Western Branch, 604 Mission St., San Francisco.
 Eastern Branch, 1779 Broadway, New York City.



No. 252. Automatic Cord Winder, with cigar lighter (No. 202) and holder. Price, \$5.00



No. 291. A combination trouble lamp and searchlight, with 6-volt, 6-c. p. Edi-Swan base bulb. Price, \$2.25
No. 292. Same with single or double contact Anchor plug. \$2.50



No. 1000. "Presto" Electric Hand Lamp—an adjustable light for attachment to any dry battery. Price, \$1.00
 With battery, \$1.25



No. 640. Metal Dash Lamp. A close, compact lamp for counter-sunk clocks, speedometers, vibrators, etc. Price, \$1.00
No. 645. Same for wood dash. 90c



No. 203. "Presto" De Luxe Cigar Lighter. Complete with 6 ft. silk cord, ebony finish handle, pearl push button, interchangeable tip and bulb and nickel-plated holder. Price, \$4.50

See us at the Automobile Show, Space D-40, 4th Floor

The U-H Magneto



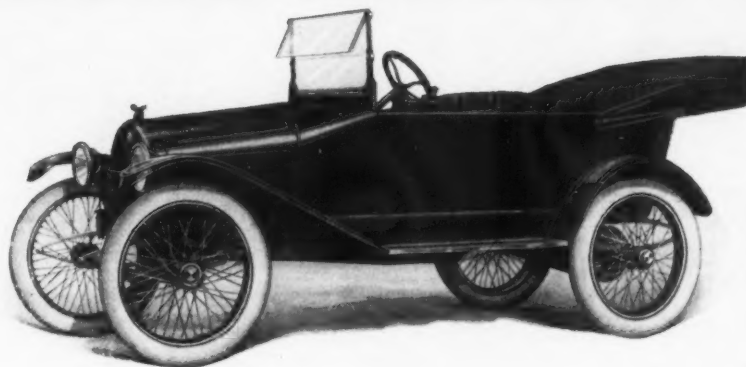
Waterproof — Easily Accessible.
 20 per cent. Increased Capacity.
 Unequalled Breaker Construction.
 Spark of Equal Intensity in Every Position of Timing.
 Automatic Starting Device.
 Automatic Spark Advance.

The U-H Magneto Company NEW YORK
 Incorporated 2 Columbus Circle

Please mention The Automobile when writing to Advertisers

\$600 Equipped Complete, including Gray & Davis Electric Starter and Electric Lights.

Plate glass rain-vision built-in wind shield.
Stream line body, instant "one man" top.
32-inch wire wheels.
32 x 3 1/2-inch Goodrich clincher tires.
Tufted upholstery, deep cushions.
105-inch wheel base, standard tread.
Left-hand drive, center control, fibre grip gearless transmission, 25 h.p. water-cooled motor, Bosch magneto, Hyatt roller bearings, speedometer, built-in gasoline gauge, robe and foot rails, signal horn, jack, tools, etc.



This new METZ Touring Model is a winning proposition for enterprising dealers. It is a strictly high class car, deserving of your fullest confidence and recommendation, its attractive price being by no means its chief "talking point."

METZ "25"

The Quality Car

It is impressively complete and up-to-date, from its wire wheels and electric starter to its one-man top and electric lights. Wonderfully easy riding, clean-cut in design, luxuriously finished, and so simple in operation and reliable in performance that a woman can safely drive it.

We have planned and are developing an elaborate publicity campaign designed specially to help our dealers. We want representation in your territory. Write for particulars and new catalog "J."

METZ COMPANY

WALTHAM, MASS.

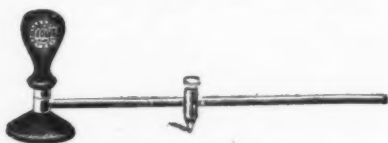
THIS "RED DEVIL" WILL CUT CIRCLES



It's the only practical glass cutter ever made for cutting full circles, half circles, or curves in any kind of glass—No. 263 "Red Devil" glass cutter. Useful for repairing headlights, etc. Has graduated rod marked to 16ths of an inch.

Sent postpaid for \$1.25.

"RED DEVIL" CIRCULAR GLASS CUTTER No. 033



Cuts curves and circles with accuracy. To be had from your dealer or postpaid for 50 cents.

Send for booklet of Red Devil Tools.

Smith & Hemenway Co., Inc.
172 Chambers Street, New York City

Troy Trailers

Double the Value of Your Truck

Keep your expenses where they are, but double your deliveries by hitching a Troy Trailer to your motor truck. That divides your costs and multiplies your capacity. Stop carrying and start hauling. Capitalize the draw-bar pull of your truck. Make one truck do the work of two. Every truck can pull more than it can carry if it has the right type of Trailer. Troy Trailers are proved by performance. Write for new book 4A.

The Troy Wagon Works Company

Troy, Miami County, Ohio

New York
50 Church St.

Detroit
319 Hammond Bldg.

Washington, D. C.
505 Riggs Building



M. A. Newmark & Co., Los Angeles, Cal., made total deliveries of 20 to 25 tons a day with a five-ton truck. The use of a Troy Trailer raised their deliveries to 50 tons daily and divided the cost per ton.

Please mention The Automobile when writing to Advertisers

Sells on Sight to Ford Owners

Simple, Permanent and Efficient

The Improved Colstad Power Ford Tire Pump is the result of over three years of experimental and development work.

The Colstad always has been the simplest and most reliable Ford Power Tire Pump ever produced and now with its positive silent chain drive it is absolutely efficient to inflate regular or oversize Ford tires to the desired pressure in two or three moments. The pump cannot slip or fail in operation.

The Colstad is the original Ford Power Tire Pump.

*Made in a thoroughly
workman like manner and
fully guaranteed. : :*

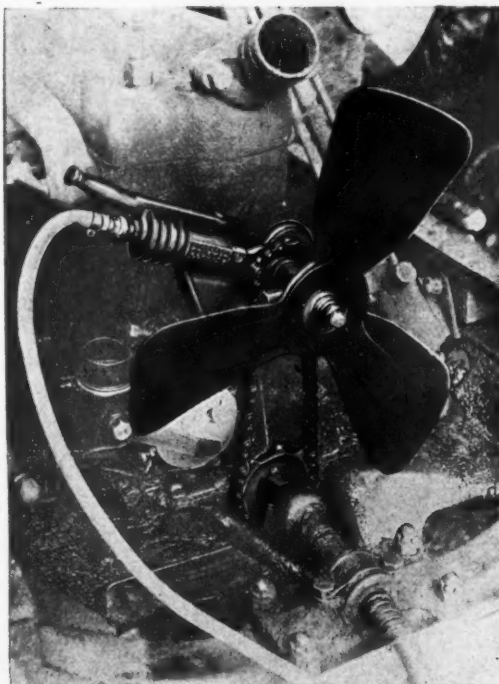
Complete and Easy to Install

The Improved Colstad Power Ford Tire Pump Equipment consists of the Pump, Hose, Fan, Silent Chain Drive Mechanism—all for \$10.

We furnish this equipment complete to insure easy installation. Hammer, screw driver and wrench are all the tools required to equip a Ford.

None but a chain drive is effective to drive a pump. We have experimented with and discarded belt and split gear drives.

COLSTAD



*Its installation is a benefit
to the car as well as to its
owners. : : : : :*

Write for Our Dealer Proposition

SPECIALTY SALES COMPANY, Sole Distributors
2 PARK PLACE, BOSTON, MASS.

Please mention The Automobile when writing to Advertisers

\$695.⁰⁰**112-In. Wheelbase
Electrically
Started and Lighted**

Lightness, with strength and dependability—this is the SPHINX Car, in a few words.

This 112-in. wheelbase car with 4-cylinder monobloc motor, delivering 28 H.P., and with full standard equipment, handsome streamline body of excellent design and finish and easy riding cantilever springs, is pre-eminently the up-to-date light car for the average American family. It represents the point of arrival—the latest and most satisfactory result—in the transition from the big-car type to the popular-price car of full equipment and fine appearance.

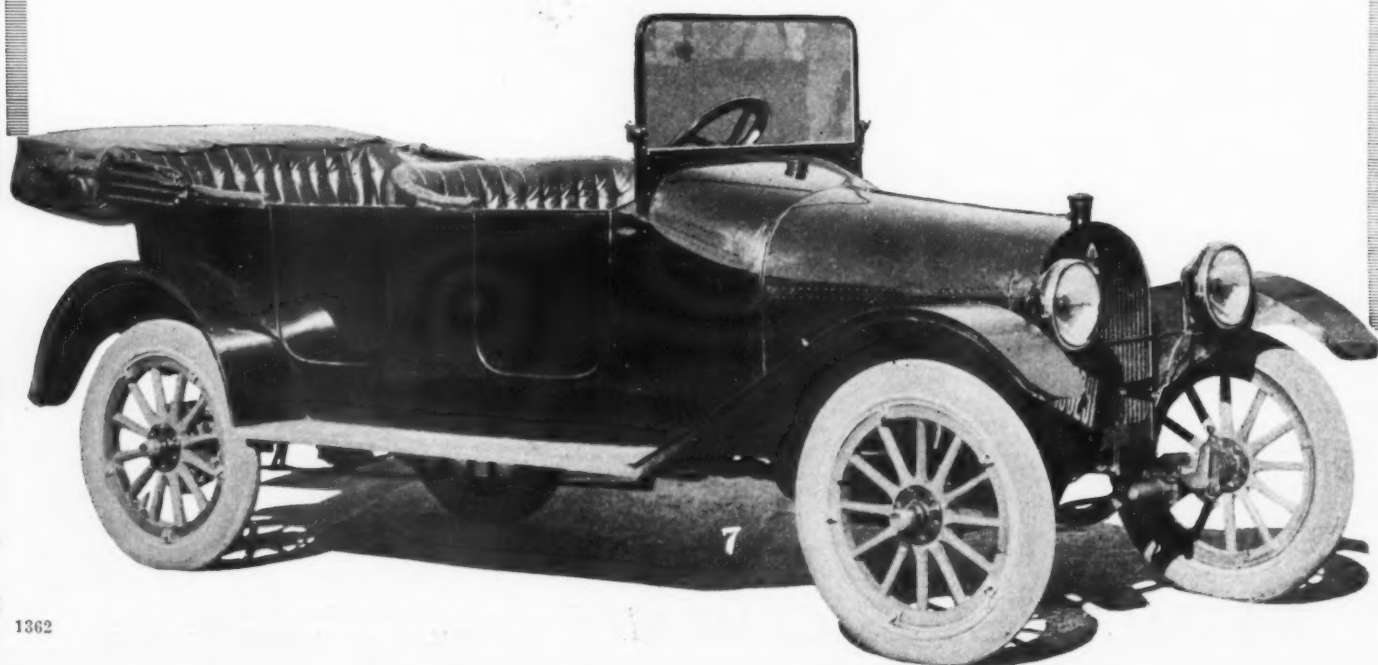
We say most emphatically and without equivocation that the SPHINX Light "Four" is the car with the largest selling possibilities to-day.

To clinch the matter and make it superlatively attractive to dealers we have a money-making proposition for SPHINX agents, carefully designed to move the cars into the possession of the great waiting public.

If you wish to embrace the opportunity of seeing this most remarkable car, if you want to secure your district rights, write or telegraph us immediately.

Will be on exhibition at 1692 Broadway, N. Y., from January 2d to 9th, 1915—and Greer Bldg., Chicago, January 23d to 30th, 1915.

SPHINX MOTOR CAR COMPANY, York, Pa., U. S. A.



1362

Please mention The Automobile when writing to Advertisers



"The Car of a



This announcement contains information so astonishing as to be revolutionizing

The Gas Motor Car with an Electric Transmission

(Not to be confused with the Electric Gear-Shift)

It seems hardly possible but it is true that the last bugaboo of motoring—the problem of obtaining the correct relative speed between engine and car—has been removed, the objectionable gear box discarded and we now have

The Car of a Thousand Speeds

Everybody realizes the smooth flexibility of the electric and can imagine what a joy it would be to have a motor car which combined all the sturdiness, lightness, power and range of operation of the gasoline car, with the smooth, quiet, lever-controlled power of the electric, sliding from speed to speed without the slightest appreciable effort.

The Owen Magnetic

is equipped with the wonderful *Entz Magnetic Transmission*.

In this simple device you have the first motor car application of the simple principles involved in the generation and utilization of electric power everywhere. Modern power as applied in factories and on steamships is invariably first turned into electrical energy and then used in motors because of the simplified transmission. There is no mechanical connection between the engine and the rear system. Yet with less loss of power than is now expended in the change gears, with a great simplification of parts, and without the addition of any weight, this simple device makes the absolutely perfect magnetic flexibility between engine and rear system which gives the driver a sense of flying rather than of driving. Bear in mind that we are doing on the motor car only what is done to-day in every modern shop where highest efficiency is the objective.

With this system the clutch and clutch pedal, the gears, the fly-wheel, the separate electric starter and generator are completely eliminated.

In place of this mass of machinery you have the simple *Entz Electric Transmission*.

Any one can operate this simple system. It operates like an electric. The simple lever on the starting column gives you any desired ratio of speed between engine and axle. The power is never disconnected from the driving wheels as you change speeds, so that the car may be increased in speed smoothly and evenly without the slightest jolt or without any mechanical action whatever except the moving of the lever on the wheel from the dead start to maximum speed.

The OWEN MAGNETIC may be called a Gasoline-Electric. It combines all the advantages of the gasoline car with all the electric's advantages. It has the gasoline car's power, its speed, its unlimited mileage. It has the lightness of the gas car because it has no heavy batteries. Yet it has the silence of the electric, its flexibility, its thousand speeds. It has the electric's freedom from gear-shifting and its freedom from the clutch. It has the electric's simplicity and its ease of operation.

Think what that means. Think of never touching a gear shift or a clutch. Think of regulating speed from two miles an hour to sixty by a lever on the wheel. Think of the only connection between the engine and the driving wheels being magnetism acting in an air space—a steady, flexible power not subject to sudden shocks. All this without any new complication, and without as much complication as you now have in geared cars. Don't you realize that such a car is bound to displace the four-speed geared cars you have known so long?

Thousand Speeds"

The OWEN MAGNETIC

No other car on earth holds any comparison whatever with the OWEN MAGNETIC for supreme flexibility.

There are two things you should know about the wonderful OWEN MAGNETIC CAR—

FIRST:—The OWEN MAGNETIC comes from an experienced and authoritative source. This electric system was invented by Mr. J. B. Entz, whose inventive ability has placed his name in the list of America's greatest inventors. He made the first electric dynamos for the United States Navy and was Chief Electrical and Designing Engineer for the Edison Machine Company, afterwards the General Electric. He is also the inventor of the highly successful Entz Electric Starter. Mr. R. M. Owen of the OWEN MAGNETIC has for many years been well-known in the industry. Until recently he was Vice-President of the Reo Motor Car Company. So the men behind the OWEN MAGNETIC are practical, experienced and successful. When such men commit themselves to a device after years of tests, there can be no reasonable question about it.

SECOND:—The OWEN MAGNETIC is not an experiment, but is a public presentation of the success of this system throughout the past ten years. Many discriminating motorists are now driving these wonderful cars. One car alone has been operated for 150,000 miles. For years these cars equipped with this electric system have run side by side with similar cars with gear transmission through all conceivable driving conditions, over mountains, across states, over clay and through sand, and the OWEN MAGNETIC has proved itself victor every time. For economy this system has proved itself a little better than the gear set and for hill-climbing considerably better. So, the OWEN MAGNETIC comes in the form of a big public announcement of tremendous, all-important interest to those who keep abreast of motor car progress and who appreciate automobile evolution. This year the OWEN MAGNETIC will have a degree of exclusiveness. We shall build only a limited number of cars—practically custom made—of the highest quality throughout. But this Magnetic Transmission is bound to shortly become as common as self starters. Once its attractions become known, a high-grade car can't be marketed without it.

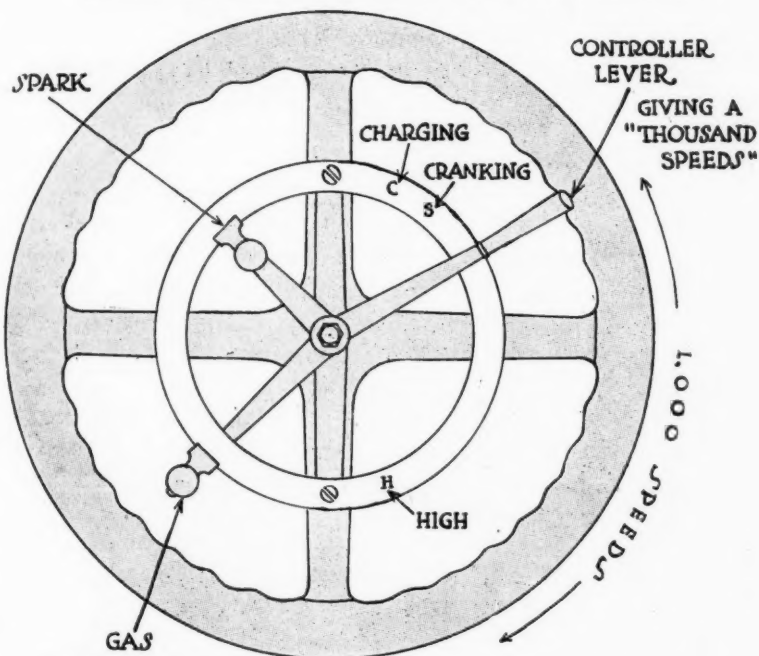
3-Passenger Roadster, \$3750 } F.O.B.
7-Passenger Touring Car, \$3750 } New York

The only American car with three individual brakes or brake-systems, which, if necessary can all be actuated at the SAME time.

The additional third brake is an electric-magnetic one, which is put into action, by simply moving the control lever on the steering wheel into neutral position, from any speed. This brake will hold the car at 10 miles an hour going down the steepest and longest hills, without the so common danger of overheating or burning the brake. IN THIS THIRD BRAKE THERE IS NO BRAKE LINING USED, in fact there are no parts in actual contact. The braking effect is produced by the magnetism of the motor-field PREVENTING the armature from revolving over a certain number of revolutions per minute. The faster you run, the more effective this brake will be.

We have an illustrated catalogue in preparation and will be glad to send you a copy on request.

See our exhibit, Grand Central Palace, C-3, Third Floor



No clutch. No gears to shift.

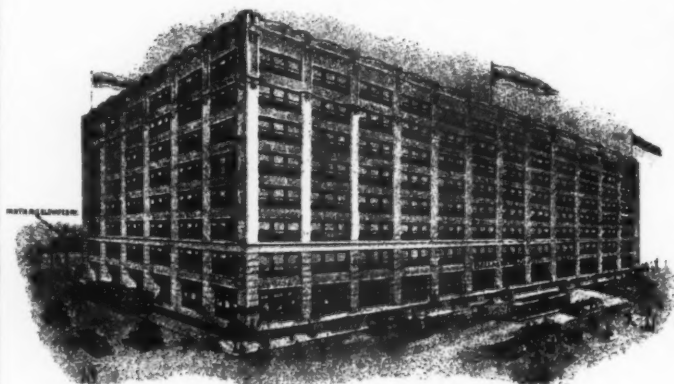
Electric transmission acts also as self-starter, generator, and electric brake.

R. M. OWEN & COMPANY, Inc.
NEW YORK, N. Y.

SALESROOM:
7th Avenue and 49th Street

FACTORY:
5th Avenue and 142nd Street

THE WORLD'S LARGEST EXCLUSIVELY WEARING APPAREL MAIL ORDER ESTABLISHMENT.



BELLAS HESS & CO

WASHINGTON, MORTON & BARROW STS.

NEW YORK CITY'S LATEST STYLES SENT TO YOU WITH OUR
POSITIVE GUARANTEE OF PERFECT SATISFACTION
OR MONEY BACK INCLUDING TRANSPORTATION CHARGES BOTH WAYS.

"WE TAKE ALL THE RISK OF PLEASING YOU"

WASHINGTON, MORTON & BARROW STS.

LONG DISTANCE PHONE
9630 SPRING

New York City, N.Y. Nov. 18, 1914

Mr. R. M. Owen
R. M. Owen & Co.
New York, N. Y.

Dear Sir:-Replying to your inquiry regarding my opinion of the Owen Magnetic Car which I bought from you, will say that I have now run this car about 2000 miles, and in every way it has been more than satisfactory, and has surpassed all claims that you have made for it, and my greatest expectations.

The ease with which I can operate this car in the crowded street traffic of New York City is marvelous. The fact of there being no gears whatsoever, allowing you to keep both hands at all times on the steering wheel, and that it is not necessary to be constantly changing one's gears by shifting the lever as every other make of car requires, is surely a tremendous advantage.

I have not had the slightest trouble of any sort, and as you know, I received practically no instructions as to how it should be operated.

Aside from this wonderful Electrical Transmission feature, the powerful self starting, and powerful electric lighting features, would in themselves recommend it to me over any other car, for while I have had nearly every other starting device and lighting device in the cars I have formerly operated, none of them has ever compared with this.

The entire driving and operating of this car is so unlike any other that it is hard to make a comparison. I have one objection, and only one to this car. It has absolutely spoiled me for driving any other. It now seems such an absolute waste of energy and trouble for me to operate a car, where the shifting of gears, etc., is necessary, that I am using the Electrical Transmission Car which you sold me exclusively.

You have my sincere congratulations on turning out an automobile, the principle of which I firmly believe will revolutionize the entire industry.

Yours truly,
H. Bellas Hess

CR-HBH

WE PAY ALL MAIL OR EXPRESS CHARGES TO YOUR TOWN.



Automobile Stampings, Drawn and Spun Metal Work of All Kinds

We can handle your sheet metal work, your stampings, your drawn and spun metal work at a much lower cost than you can handle them in your own sheet metal department. We have special equipment for quantity production.

We have 15 acres of floor space devoted to sheet metal work—we have had 33 years' experience in drawing, stamping and spinning of sheet aluminum, monel metal, brass, copper, tin plate and sheet steel—our machines and equipment are the very best obtainable—our men are *experts*.

We have no idle hours in our sheet metal department, no non-productive machines whose overhead is eating up our profits. By keeping our system at top speed all the time we are able to turn out work at lower cost.

15 Acre Plant and 33 Years' Experience at Your Service

We are specially equipped to handle automobile-part work. Our facilities enable us to meet the most difficult situations in light and heavy sheet metal stampings or drawings.

Send blue print or samples and let us estimate on Hoods, Clutch Cases, Covers, Joint Cases, Housings, Pans, Shells, Drums, Gasoline Tanks, Mufflers, Metal Instrument Boards, etc.

You are undoubtedly casting some part that could be turned out better and at a lower cost by stamping.

STAMPINGS

PORCELAIN ENAMELING

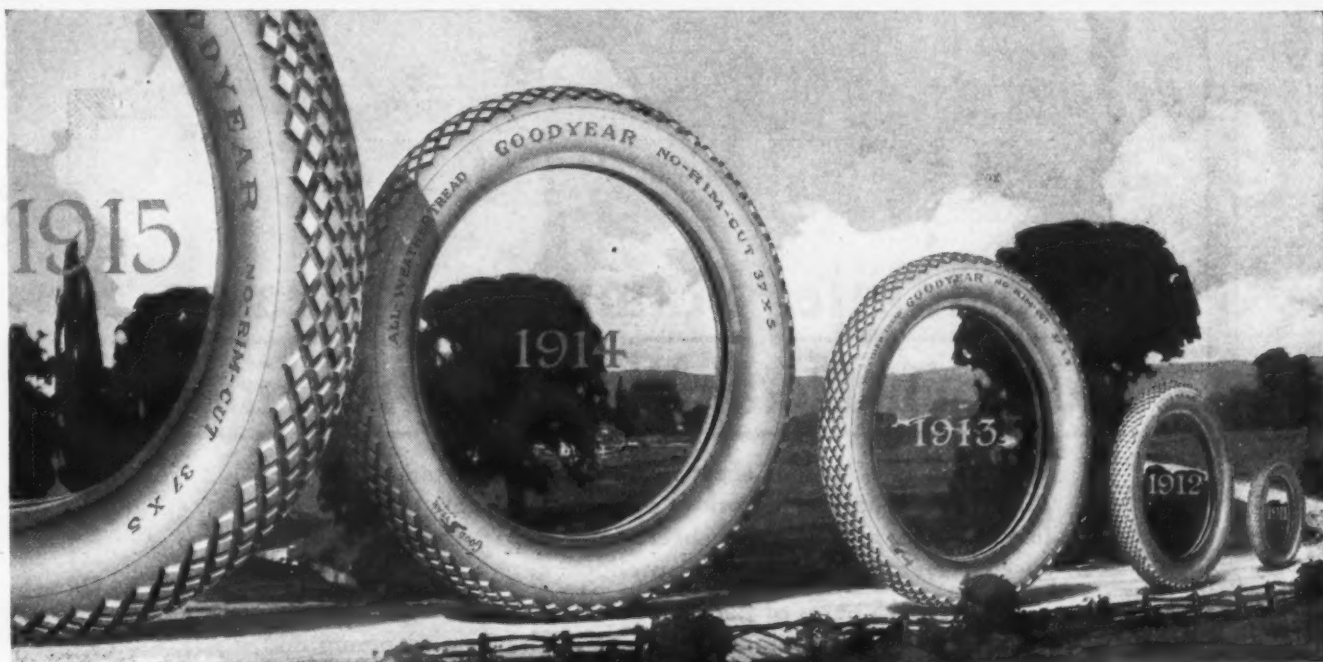
GEUDER, PAESCHKE & FREY CO.

Canal and 15th Sts.

Milwaukee, Wis.

G.P.&F. Service
"Knowing How Since '81"

Please mention The Automobile when writing to Advertisers



Note How Goodyear Grows As the Years Roll By

1,479,883 Tires Last Year

In the fiscal year just ended we sold 1,479,883 Goodyear pneumatic automobile tires. That's about one tire for every car in use.

It was 26.6 per cent more tires than we sold the year before. It was half as many tires as we had sold in our previous 14 years combined.

It was more per month than we sold per year back in 1909.

It is more than were sold of any other tire that's built.

To Men Like You

We sold these tires to men like you—men who seek quality tires. To men who want safety, strength and endurance. To men who watch tires and compare them.

Some had accidents with tires. Some misused and wrecked them. And some, no doubt, got faulty Goodyear tires.

But there's the record after 15

years—after millions of tests and comparisons. The final verdict, as shown by sales, is that Goodyear tires are best.

Fortified Tires Five Exclusive Ways

Goodyear Fortified tires protect you in five exclusive ways.

One combats rim-cutting in the most efficient way that's known.

One means safety. These tires are held on by an unstretchable tire base, in which we vulcanize six flat bands of 126 braided wires.

One saves needless blow-outs. Our "On-Air" cure—which costs \$1,500 daily—prevents the countless blowouts due to wrinkled fabric.

One—a patent method—reduces by 60 per cent the risk of tread separation.

And one combats punctures and skidding. That's our All-Weather tread—tough and double-thick, flat and smooth-running, sharp-edged and resistless.

All these features are in Goodyear Fortified tires. Not one of them is found in any other.

Let Them Prove

This isn't written to sell tires, for tires must sell themselves. We simply urge you to test the tires which won this matchless showing.

They outsell any other. They are gaining new users fast. They are fortified in exclusive ways against five major tire troubles.

You cannot, we argue, be fair to yourself without proving out these tires. And now, with the new year, is a good time to do it.

Any dealer will supply you if you say you want Goodyear tires.



THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

(2040)

Please mention The Automobile when writing to Advertisers

HERZ PLUG

"Bougie Mercedes"



\$1.50
postpaid, or
from your
dealer.

is the result of 20 years of study, experiment and improvement. Its marked superiority over ordinary Plugs is due to the distinctive features of its construction. The insulation is Unbreakable Double Stone (Blue Enameled); there are Four Sparking Points; the electrode of Platinum-Alloy will not burn away; and the Plug is self-cleaning. Every HERZ PLUG is guaranteed a year.

There are special HERZ PLUGS for the Amplex, White, Ford, Pierce-Arrow, Pullman and Overland. Write for the Plug that is best suited to the needs of your particular motor. For most motors, the standard HERZ PLUG is best adapted.

HERZ MAGNETO ensures a fat, hot spark even at a low speed. Compact, reliable, dust-proof, waterproof.

HERZ DISTRIBUTOR provides, with good single coil, an accurately timed and permanently reliable ignition outfit. Very small yet perfect in every detail.

HERZ PATENT DETACHABLE TERMINALS are ideal for convenience. Easy to attach, and they stay attached, making a perfect connection. Equally easy to detach.

HERZ MINIMAX GARAGE PUMP is as inexpensive as a thoroughly efficient Pump can be built. No leakage losses. Can be attached to any lamp socket. Height 30 in., length 35 in. Made for any kind of current. Pressure up to 200 lbs. Splash lubrication.

HERZ TIMER gives the most exact timing independent of the speed. It saves current

HERZ TAPE GRIP provides the perfect connection between metal pipe and rubber hose. Quick and easy to apply.

HERZ & CO., 245 W. 55th St., (near B'way) New York

THE TRINITY BELL

**Warns Both
Eye and Ear**

**The Signal That
Never Offends**



Made in three styles:
Model A—3½ inches in diameter, with Red Light. Especially adapted to the smaller cars. Price, complete, \$6.

Model B—5 inches in diameter, with Red Light. Most effective for Roadsters, Runabouts and Touring Cars. Price, complete, \$10.

Model C—6 inches in diameter, with Red Light. Preferable for Limousines,

Heavy Touring Cars and all trucks. Price, complete, \$12.

Any of these bells may be secured with an ornament instead of the Red Light, at no advance in price.

All prices include complete equipment for installation, including 12 feet of best insulated wiring, choice of bracket (for running board, fender, cowl, dash or radiator cap), push button, bolts and washers.

An effective warning signal that sweeps the road clear, without giving offense, is essential to the equipment of every automobile. The clear note of a perfectly made bell—the best of all warning signals—seldom fails to secure the right-of-way, even in crowded streets.

Such a motor vehicle warning signal is the decisive, convincing, effective, TRINITY BELL, a combined alarm and flash, that warns both eye and ear—and never offends.

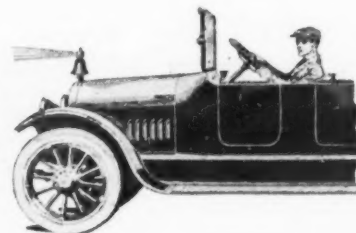
The bell proper is surmounted by a small Tungsten light, with three red lenses that flash a warning the moment the signal is sounded. Kewpies, Billikens, Policemen, Red Cross or lodge emblems can be supplied in place of signal lamp, at same price.

The TRINITY BELL responds instantly to the touch of hand or foot, on the push button, and

is so simple that it can't get out of order. Is impervious to dirt or water. Has water-proof enameled coil, and is cast from the finest bell metal, heavily nicked. Beautiful in tone. Contact points of pure platinum. Solid as a rock—will not rattle.

Answers all requirements of law, and is absolutely guaranteed. Protected by patents. *Infringers will be prosecuted.*

Dealers and Jobbers:—This easy seller is having a big run. Write for our proposition today, and get your agency early.



See Us at the New York Show, Grand Central Palace, D 17 A.

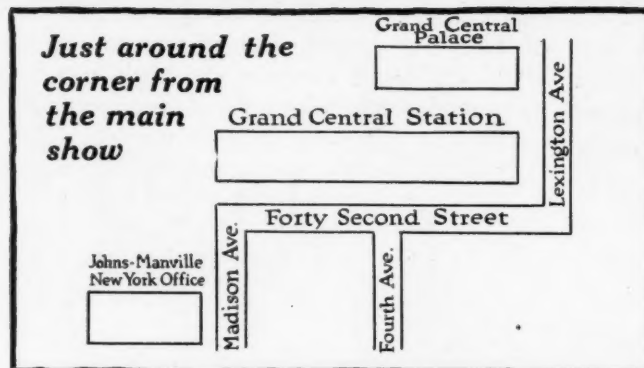
THE TRINITY BELL ELECTRICAL MFG. CO.
5108 Calumet Avenue Chicago

Branch Offices: Trinity Bell Sales Co., 11 N. Cascade Ave., Colorado Springs, Colo.;
2028 Farnam Ave., Omaha, Neb.; 519 Downing Bldg., Erie, Pa.

Please mention The Automobile when writing to Advertisers

Johns-Manville Accessory Show

January 2nd to 9th Inclusive, Madison Ave. & 41st St. New York



Every Accessory Exhibited Here Holds a Personal Interest For Every Manufacturer, Dealer and Car Owner

DURING the week of New York's Automobile Show we shall devote the ground floor of our New York Building to an exhibition of J-M Automobile Accessories.

In whatever capacity you are interested in accessories your attendance at this exhibition will surely result to your profit.

Please note the convenience of our location to the Grand Central Palace, as shown by the map above.

J-M Accessories on Exhibition

Jones Speedometer

The standard speedometer of the standard type, Centrifugal. Absolutely and permanently accurate, unaffected by temperature, altitude or vibration. More Centrifugal Speedometers will be used on cars manufactured in 1915 than all other types.

Long Horn

The horn that insists. Powerful warning qualities, great reliability, and construction that lasts as long as the car. The horn you want if you're looking for signal safety and the horn you will buy if you compare values.

Other J-M Accessories

J-M Non-Burn Brake Lining
Johns-Manville Shock Absorber
J-M Lens (Non-Blinding)
J-M Automobile Tape
J-M Tirenew
J-M Narco Tire and Top Savers
J-M Fire Extinguisher
J-M Automobile Clocks
J-M Dry Batteries
G-P Muffler Cut-Out
"Noark" Enclosed Fuses

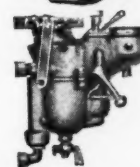
J-M (Mezger)

Soot-Proof Spark Plug

Carefully designed and constructed, embodying the best skill and labor and giving the best service and satisfaction of any high-grade automobile plug. A guaranteed product of the most efficient manufacturing methods.

Carter Carburetor Multiple-Jet

A different principle but one of proven greater efficiency. Excels as a gasoline saver. Increases power and flexibility to a remarkable degree. Results unconditionally guaranteed.



2944

H.W. JOHNS-MANVILLE CO.

Madison Ave. & 41st Street New York

Please mention The Automobile when writing to Advertisers

1/2 Ton Less Weight

The New Light Baker Electric Coupe weighs 2913 lbs.—*a full thousand pounds less* than any of the big heavy five-passenger electrics, and *from 400 to 500 pounds less* than ANY enclosed electric of high grade make. Mere reduction in weight is no advantage in an electric if secured at a loss of speed, mileage, power, strength or comfort. The achievement of the Baker is in its light weight

PLUS

FULL SPEED
FULL MILEAGE
FULL POWER
FULL STRENGTH

The speed is 23 miles per hour—the highest ever built into an electric coupe. As for mileage, no electric made gives more per battery charge. In point of power, this light electric will negotiate any hill that any motor car can climb. And it will *stand up*

through years of hard service, for it has the same structural strength which has characterized the Baker chassis and body for over fifteen years. (Baker Electrics have always been light weight cars.) And in addition, with so much less weight to carry,

The New Light Baker Electric Coupe

is *much easier to handle* on rough pavements or in congested traffic—it steers and turns with the least effort. There is *less wear and tear* on the car; tires last longer; *upkeep expense is reduced*. In short, this electric becomes more than ever a source of pleasure, because of its lighter weight.

In style and beauty the New Light Baker has set

a new standard. Needless adornment has been supplanted by a rich, simple refinement. The color effects are attractive and novel. There is not a more luxurious automobile made.

In the face of these facts, is there any good reason why you or your wife should lug around from a quarter to a half-ton of extra dead weight in an electric?

The Baker Double Drive Brougham

is one of the most luxurious electrics of the larger type that has ever been built. It closely resembles the New Light Coupe in general design, the difference being in its larger proportions to accommodate five people instead of four, its double drive feature which enables operating from

either front or rear seat, and its seating arrangement. For those who require a large five-passenger car this imposing brougham, equipped with every known motor car refinement, is an ideal model, and for a car of its size it is *lighter than any other electric made*.

Before you buy an electric, read page seven of the new Baker catalog, mailed on request.

PRICES—BROUGHAMS: Worm gear, double drive or front wheel drive, \$3250; COUPES: New Light Baker, worm gear, lever or wheel steer, \$2800; BEVEL GEAR COUPE: \$2600; ROADSTERS: Bevel gear, lever or wheel steer, \$2300.

Also a complete line of commercial trucks from one to five tons.

THE BAKER MOTOR VEHICLE COMPANY, CLEVELAND

**Baker
Electrics**
QUALITY SERVICE



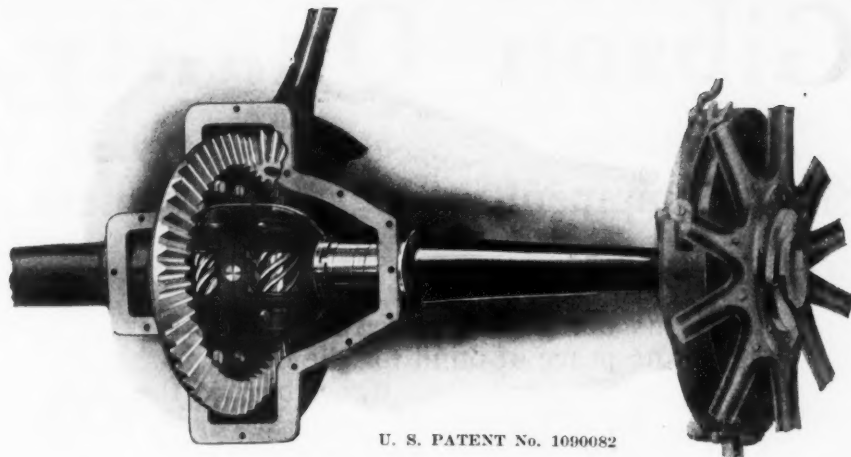
The New
Light
Baker
Electric
Coupe.
Price
\$2800.

Please mention The Automobile when writing to Advertisers

America's Greatest Gear Factory Makes the "M & S" DIFFERENTIAL

STOPS THE
SKID BEFORE
IT STARTS.

INTRODUCES
SAFETY TO
THE AUTO-
MOBILE.



U. S. PATENT No. 1090082

Europe
wanted trucks
with a differ-
ential lock.
The M & S
does all that
a lock will do,
& a great deal
more as well.

The Brown-Lipe-Chapin Co. of Syracuse, the largest makers of Differential Gears, have contracted for the American manufacturing rights of the M & S and can now supply sample gears to car manufacturers' own specifications.

Jeffery Adopts "M & S"

The "Jeffery Quad" used by the U. S. Army and selected for use in Europe is equipped with M & S Differentials. Eight big manufacturers are now making exhaustive tests with a view to equipping their cars with this new improved Differential which gives an entirely new conception of rear axle efficiency. Some car makers are already satisfied and have closed contracts for next year.

"M & S" Gives Equal Pull on Both Rear Wheels

This means that you can make shorter turns—that you save wear on tires and add from 500 to 1,500 miles to their life. That you get more mileage per gallon of gasoline—that all the power of your motor is used for driving the car instead of some of it being lost, as it is by the old style differential.

Your Rear Wheels Can't Spin

You can get out of mud holes, sand or snow if the wheel has even the slightest traction. Your engine can pull greater loads with less strain—your car runs smoother and more evenly and the danger of skidding on slippery streets or in mud is largely done away with.

See the "M & S" Differential at Shows—At the Exhibit of the Brown-Lipe-Chapin Co.

Learn the secret of the new mechanical principle demonstrated by the "M & S" which has caused engineers and manufacturers to marvel at the results given by this wonderful new differential. Absolute proof will be given that the "M & S" Differential will do even more than we claim.

A Special Type "M & S" for Ford Cars

In order to give Ford owners an opportunity to increase the efficiency of their cars and to provide for Ford differential replacements a special type M & S has been designed for the Ford Car. Any mechanic can install it in a few hours. The cost is only a trifle more than the regular Ford bevel gear differential. But the advantages are so evident that no Ford owner will be satisfied with his present differential when once he has driven a Ford equipped with the M & S.

Dealers in Ford parts and accessories can get particulars regarding territory, prices and approximate delivery dates by writing the M & S Gear Co., 1528 Grand Avenue, Kansas City. Order for your Ford now.

If you don't go to New York write for further particulars and literature

For particulars regarding the M & S as stand-
ard equipment for pleasure cars and trucks
BROWN-LIPE-CHAPIN COMPANY
SYRACUSE, NEW YORK

For Ford agency arrangements on the M & S
replacement proposition write
THE M & S GEAR COMPANY
KANSAS CITY, MISSOURI

Please mention The Automobile when writing to Advertisers



Gibson Quality

**Accessories
Shop Equipment**

**Service
Treatment**

More Than a Name

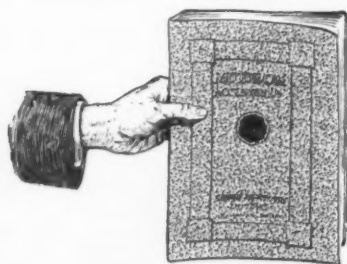
- it means doing things EXACTLY RIGHT.
- it means peace of mind for the dealer.
- it means a guarantee that goes beyond the manufacturer.
- it means QUALITY in every sense.
- it means service that is beyond criticism.
- it means that an accessory carrying this brand has been tried, proven and is the best that can be found in any market.

FIFTEEN YEARS

serving the Dealers in this line from Maine to California, from the Lakes to the Gulf, their loyalty to this house is reflected in our remarkable growth—all the result of a system of Fair Treatment, Quality Goods and Instant Service.

The Most Complete Stock of Motor Car Accessories and Shop Equipment in America—Insures you IMMEDIATE shipment on every requirement.

We are General Sales Agents for FALCON TIRES AND FALCON INNER TUBES, the HIGHEST QUALITY Tire Products obtainable. A proposition every Dealer should have—it is a money maker and a trade builder. SEND FOR DETAILS AND CONTRACT.



Place your accessory orders with GIBSON and be assured of

**Service,
Prices, Quality and
Fair Treatment**

**Gibson Automobile Co.
316 North Capitol Boulevard
Indianapolis**

In preparation—the Gibson 1915 Catalog. The authority on Automobile Accessories. A complete Dictionary of Supplies and Shop Equipment. It is for the Dealer ONLY. Ready for distribution about early in 1915. Edition is limited—get your request in early.

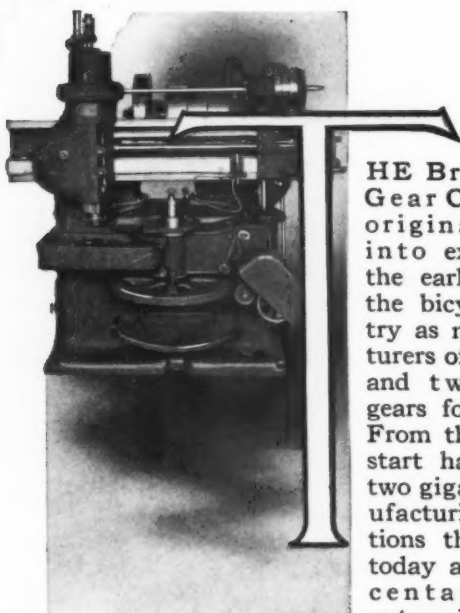


Please mention The Automobile when writing to Advertisers

BROWN-LIPE GEAR C^o

SYRACUSE
N·Y· U·S·A·

BROWN-LIPE-CHAPIN C^o



THE Brown-Lipe Gear Company originally came into existence in the early days of the bicycle industry as manufacturers of sprockets and two speed gears for bicycles. From that humble start has grown two gigantic manufacturing institutions that supply today a big percentage of the automobile manu-

facturers of this country with their differentials, transmissions and control sets. In the plant of the Brown-Lipe-Chapin Company are produced the differentials, while the Brown-Lipe Gear Company confines its manufacturing facilities to the production of the various types and forms of transmissions and control sets. Although the holding interests of the two concerns are practically identical, each occupies its own manufacturing establishment, and each is operated just as separately and distinctly as though they were separately owned and geographically located a thousand miles apart.

As the demands of the automobile industry increased by leaps and bounds, and as the standing of the Brown-Lipe products grew more and more pronounced, it became an absolute necessity for greatly increased manufacturing facilities to supply the industry with Brown-Lipe products. So the single factory which had been enlarged time and again became so inadequate that the two specialized businesses must be separated.

New Company Formed

To accommodate this change a second company—the Brown-Lipe-Chapin Company—was organized and a mammoth new plant erected for the sole purpose of handling the differential end of the business. That these are incontrovertible facts may be well realized by the simple statement that in twelve recent consecutive months the output of Brown-Lipe products aggregated something around five millions of dollars, with a labor payroll in excess of a million—all for the production of these three component parts of a car.

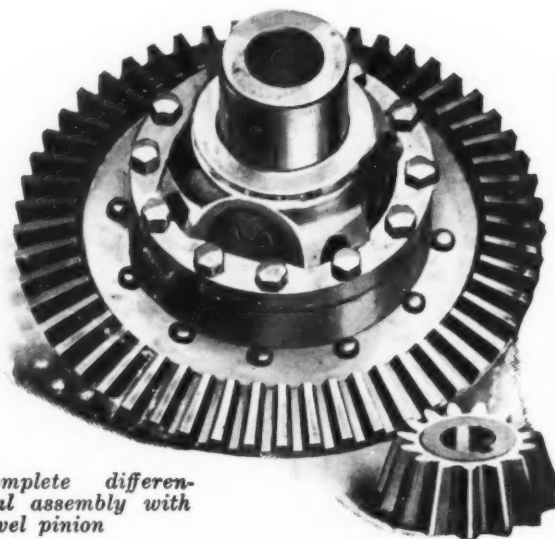
The publication of this advertisement and the advertisements that are to follow, is based purely upon a desire to justify in

the minds of dealers and consumers the wisdom of car and truck manufacturers in depending upon the Brown-Lipe organizations for such a vast percentage of these working parts.

When it is considered that the question of price has little or nothing to do with the sale of Brown-Lipe products, the simple fact of their dominating to such a marked degree, must evidence beyond contradiction the superiority of these Brown-Lipe products.

But we are not content to assume an air of independence and let our showing tell its own story, for we feel that around this enormous production can be built a story of modern manufacturing and merchandising that will give every user of Brown-Lipe products added confidence in his use of them, and which will give added emphasis to the sagacity and keen business judgment of the manufacturers who place their absolute dependence upon these products.

To the average car owner, as well, even, as to the ultra-intelligent car owner, and in many cases to the absolute trade itself, there is perhaps less known of the real problems and intricacies of gear manufacture than about most any other part of the car today. In the commonly accepted sense of the term, a differential is an unknown something that allows motor-driven apparatus to make a turn without breaking something, and the transmission is an unknown something that admits of various speeds of this motor-driven apparatus by the simple shifting of the lever. It is our purpose in this advertising campaign to set forth first in this announcement a general story of what these products are, and how they are made, and then in subsequent advertisements to show in detail the many and varied problems



Complete differential assembly with bevel pinion

and methods necessary for the manufacture of these products.

It should be remembered first—that in the generally accepted sense of the term, all Brown-Lipe products are of special construction; true enough, differentials are standardized—true enough, transmissions are standardized. But each and every car presents its own peculiar characteristics which, in most cases, require special engineering thought in designing such products as lend themselves most admirably to the particular characteristics of the car in question.

To take care of this phase of the situation, separate and distinct corps of engineers are employed, whose constant labor is not only to keep pace with advancements in design, but constantly to co-operate with the manufacturers of the country in the special designing of these parts to meet the special requirements of the individual car itself. However, the question of manufacture is largely the same in the various designs, and in describing these products in the following pages we will take as our subject representative products that illustrate the general output of the factories.

D I F F E R E N T I A L S

In ordinary language, a differential is an assembly of gears that enables the rear wheels to move at different speeds. Everybody knows that when an automobile turns a corner the inside wheel—that is, the wheel nearest the curb—revolves slower than the outside wheel.

A simile to this condition is that of a line of soldiers marching. They are all going forward at the same speed; a command is given for a turn to the right; the man on the extreme right of the line immediately begins to mark time—that is, he moves his feet in the same time as all the rest of his fellow marchers, but his steps are very, very short; in other words, he pivots—simply changes his position before the command, to a position at a right angle.

But the man on the extreme left lengthens his stride and increases his speed greatly in order to keep the line straight, each man from the left to the right going just a bit slower than his immediate companion on the left. This really is the action of the rear wheels when the car moves away from a straight line. If, as in the case of a buggy, or of the front wheels, each rear wheel were separate and detached from the other or from any common union, there would be no need of a compensating device.

But in the automobile an entirely different mechanical problem is encountered. The two rear wheels, which are the driving members, are locked to each other by the main axle shaft, when the car is proceeding in a straight line, and are both revolving at the same speed and in proportion to the speed of the engine. Provision, therefore, must be made for a breaking of this lock when the speed of the two wheels becomes different. And it is this function of permitting one wheel to go slow and the other to go fast that is performed by what is known as the differential gear.

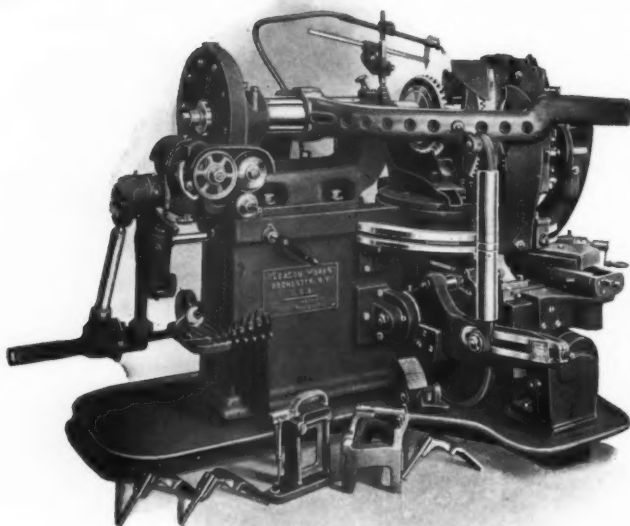
The differential set as shown on the opposite page, consists of a pair of cases, a four armed spider, two side gears, four side

pinion gears, twelve cap screws, one bevel drive gear, twelve rivets and one bevel drive pinion.

When your car is proceeding in a straight line your power is transmitted through the main driving shaft to the bevel pinion which is meshed with the bevel gear. As the shaft revolves this bevel pinion in turn revolves the bevel gear, which in turn revolves the main axle shaft and the entire differential assembly at right angles to the revolution of the main driving shaft of the engine. The main axle shaft is in two parts, each one attached firmly to its road wheel and differential side gear. This, of course, as you can see, simply makes the wheels revolve and propels the car forward.

Eberhardt vertical cutting type automatic multiple spindle gear cutting machine for roughing out two or three spur or bevel gears





*Gleason gear planer.
One of a battery of machines used in generating bevel gear teeth*

Now then, when a turn is made, instead of the power revolving the entire differential as a unit, the two side gears and the four side pinions immediately begin to turn upon their bearings in the four arm spider. In this way the difference in speed between the two wheels is assimilated or compensated for within the differential itself, by the pinions and side gears.

Were it not for the use of this differential set, every time a car was turned from a straight path there would either be a slipping and tearing of the tires and wheels, or an absolute demoralization of the axle unit itself. The technical engineering data accounting for this really simple performance is extremely mathematical and complicated, and no attempt will be made here to go into a detailed explanation of just why and how these gears admit of these performances. But if anybody is interested enough to wish for the detailed engineering data connected with this operation, we will be glad to have our engineers furnish him with such detail.

As a typical illustration of the care and attention given to the production of a differential we will illustrate operation by operation, just what it means to produce a bevel gear. The same manufacturing conditions are encountered in making all of the gears, and the same care is taken in the handling of each and every part of the set; so that what is applicable to the bevel gear as shown by the following description, is applicable straight through the manufacturing operations of a differential set.

The gear blanks—which are drop forged rings of steel of approximately the shape of the finished bevel gear—are shipped from the forge plant to the differential factory.

The first operation is what is termed the rough forging inspection. These gear blanks are gone over carefully to see that there are no cracks or flaws apparent from an outside examination.

Then a certain fixed percentage of these blanks is drilled sufficiently to get samples of the steel, which samples are sent to the chemical laboratory for analysis. The entire shipment of rough forgings is held in the receiving stock-room until the samples have been thoroughly analyzed in the chemical laboratory to make sure that the chemical specifications of the steel in these forgings is in absolute accordance with the instructions contained in the ordering of the forgings themselves.

In other words, the Brown-Lipe Company knows, from years of study and experience, just what the chemical constituency of each piece of metal should be to give the best results in the performance of its work, and to avoid any possible errors in the manufacture of this steel this chemical analysis is most carefully made. After the chemical analysis the gear blanks are still further prepared for the first machine operation by going through a preliminary heat treating and annealing process. This makes the forgings uniform in constituency throughout and removes the forging strains or internal strains. If the forgings come up to specifications they are then started on the machining operations.

Machine Operations

The first operation in the machine department consists of boring out the center of the gear and facing the back so that it presents an absolute right angle surface to the bored center. This operation is then inspected with micrometers to insure absolute accuracy of size and also is tested on specially constructed jigs.

From this inspection the gear is sent to another machine which turns the face angle and the back angle surfaces. This operation is inspected with micrometers and special gauges to insure proper measurements. At this time the blank is also placed in what is called a running fixture and inspected while running, to insure the trueness of the running gear.

The blank is then placed in a jig, drilled and counterbored. This operation is inspected in a special jig equipped with pins that insures accuracy of boring and counterboring of all the holes. At this point the various surfaces of the blank have been machined to such points of accuracy that the blank itself

can be held properly in a cutting machine which performs the next operation known as rough blocking or gashing the teeth.

Another inspection is made, and then the blank is sent to the gear generating department. It is at this point that perhaps the most unique operation in the entire manufacture of a gear takes place.

So remarkable is this process of generating a bevel gear that no attempt will be made to go into details at this time, but rather this matter will be left for treatment in an individual advertisement which will deal exclusively with this problem.

But some idea of the magnitude of the Brown-Lipe-Chapin Company may be gained from the statement at this time that the battery of Gleason gear generating machines installed in the Brown-Lipe-Chapin works is the largest battery of machines of this kind in the world.

When the gear blank comes from this operation it is completely machined, and to all outward

appearances, ready for work. To insure again positive accuracy in every way this gear, with all the machining operations completed, is sent to the inspection department where it is given a running test for sound, for the condition of tooth bearing and also for tooth measurements.

Then comes an operation which really calls for the most expert knowledge, and for the greatest amount of care and watchfulness in the entire manufacture of the product—the operation of hardening and heat treating. Up to this point we have been dealing with a piece of steel of such a carbon content as to admit readily of machining operations. It is obvious that if a piece of metal which is called upon to play as important a working part in the use of the auto-

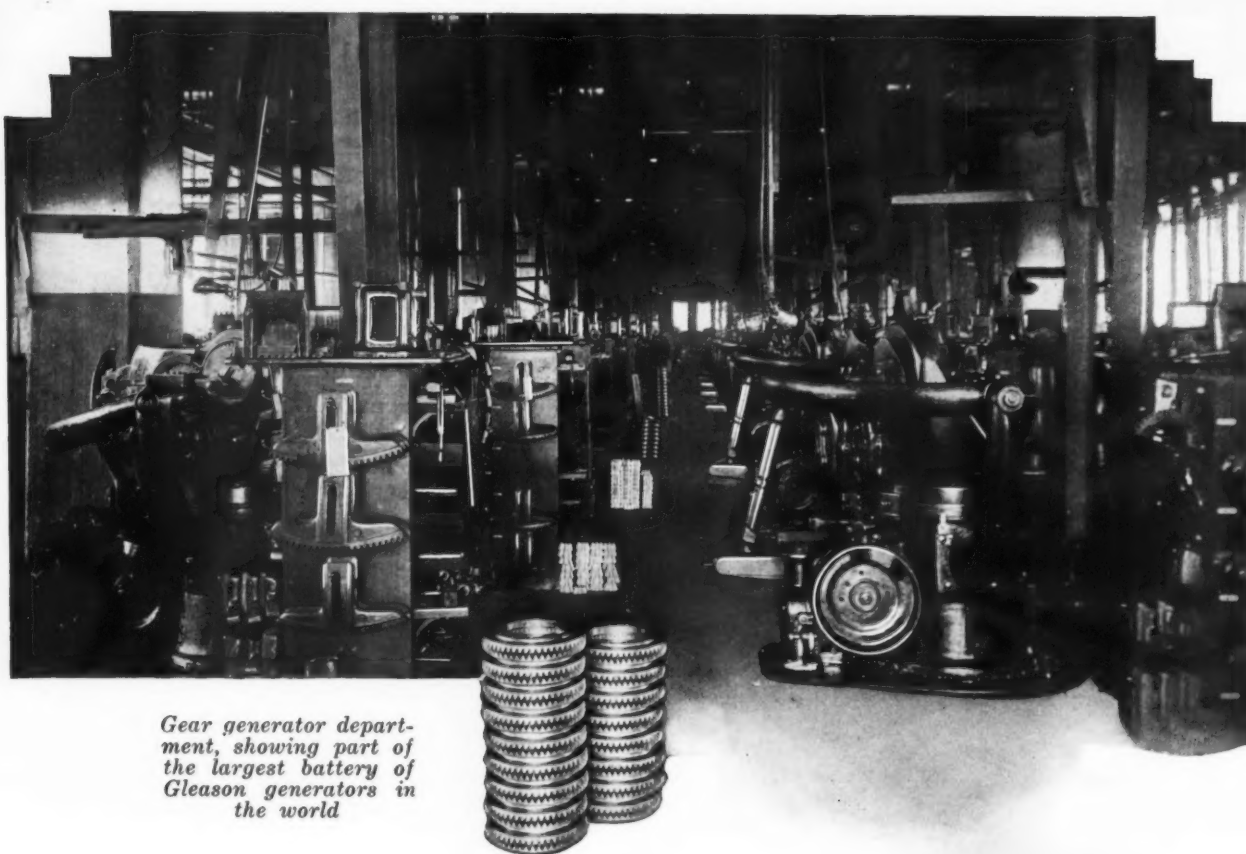
Hardening Problem

mobile as a bevel gear, were to be assembled into that automobile in so soft a physical condition as to admit of easy cutting, it would be but a short time until that gear would wear appreciably. That would mean looseness of fit, noise and general all around dissatisfaction.

So the surface of this gear—that is, the surface of the teeth of the gear, which are the parts subjected to fric-

Grinding department, where side gears and pinions for the differentials are ground





Gear generator department, showing part of the largest battery of Gleason generators in the world

tion—must be so hard as to practically resist wear during the operation of the car. At the same time the body of the tooth as differentiating from the surface of the tooth, must be tough and strong.

As we have shown before, if the surface of the tooth is soft enough to possess features of toughness and strength it is not hard enough to resist wear when in mesh and running.

Inversely, if the whole tooth, that is, both body and surface be hard enough to resist wear on the surface, then the tooth will be brittle and not tough enough to keep from breaking off under the strain of driving.

So that in the hardening department these two contrasting conditions must be faced, namely: to so treat the finished machine blank as to present a hard, wear-resisting surface on the teeth, and at the same time to retain a more soft, but more tough core or body in the tooth.

So these gears are sent to the hardening department and subjected to a carburizing process which hardens the surface of the gear to a depth of 1-32 of an inch, and refines and toughens the core. So wonderful a subject is this question of heat treating that on succeeding pages of this advertisement we will go

into the detail concerning the operation of a heat treating furnace.

The hardened gear is then sent to the testing department in the heat treating room, and by a variety of unique tests, is examined as to its hardness and evenness of hardening.

Then the gear is sent to another machine for straightening these gears inasmuch as frequently they bulge out of true during their subjection to the extreme heat. After being straightened the gear is again subjected to running tests and endurance tests, when it is ready for the grinding or sand blasting room. After being polished to mirror smoothness, the finished gear is again inspected for dimensions, and finally is subjected to its last running test for trueness.

You have probably noticed in following through this manufacturing process, that "inspection" and "test" are two words very frequently encountered. It is because Brown-Lipe products are subjected to this careful and exhaustive inspection and testing largely that they enjoy the enviable reputation in which they are held by the manufacturing public. And it is this reason also that accounts in a great measure for the extreme life and satisfactory service rendered by Brown-Lipe products.

HEAT TREATING

As indicated in one of the preceding pages, there is perhaps no single operation or handling which is fraught with so much importance, or which has required so much experimentation in the perfecting of the process, as that of the heat treating of the metal after it has been machined. For this reason the heat treating departments of the Brown-Lipe Companies are beyond doubt the most thorough and most modern, both in physical and mental equipment, of any heat treating plant known, and the methods employed to insure absolute results are most extensive and complete.

When the gears are brought into the heat treating department they are first turned over to an operator who lays them out to be placed in a certain furnace. Each individual gear is

Gears Numbered

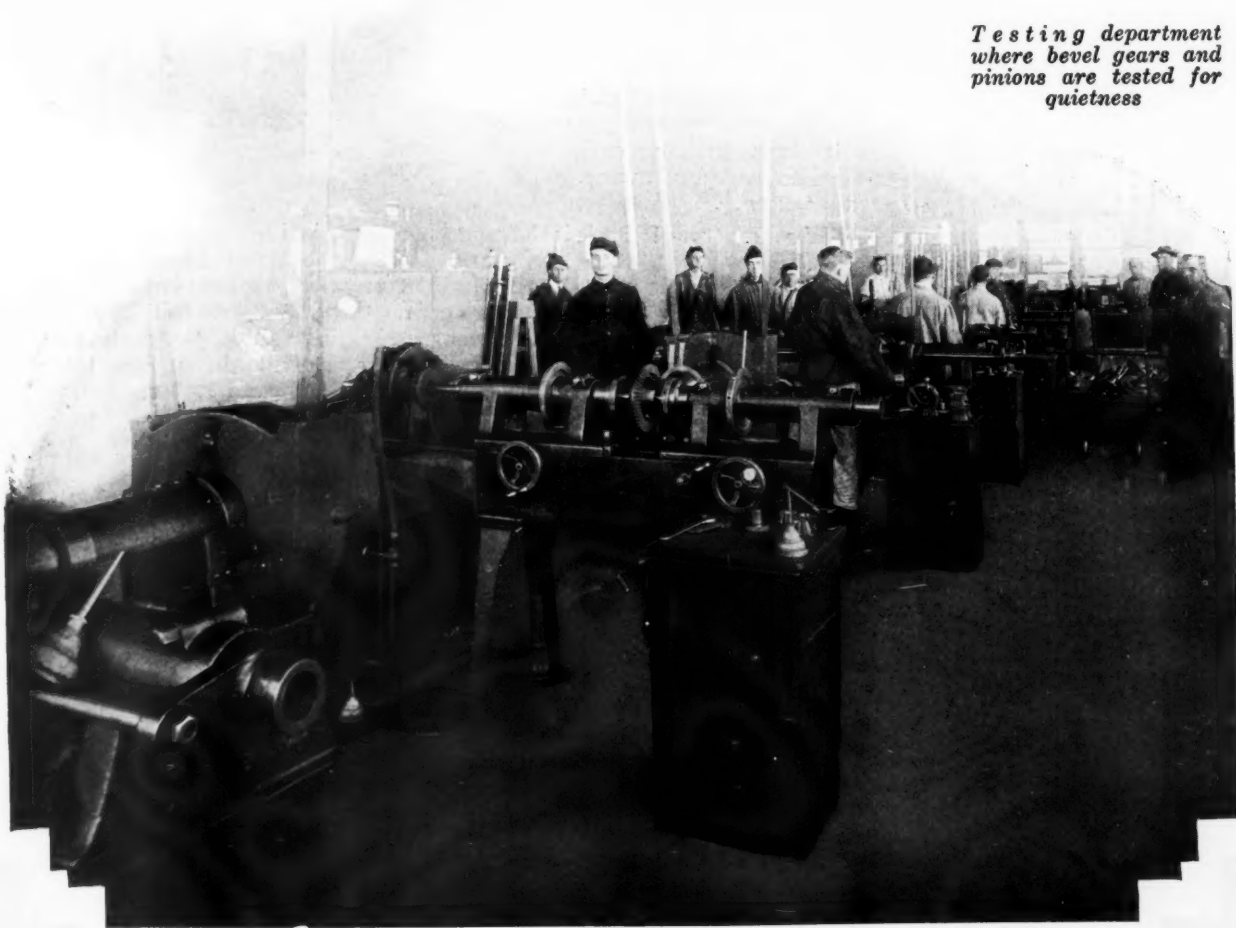
then numbered in such a manner that two or three years afterwards, if the case requires, the gear can be identified as having been heated upon a certain day, in a certain furnace,—in a

certain pot and the position in which that pot was placed in that furnace. The exact number of hours it was in that furnace and the amount of heat that was put into it can also be told from individual records that are kept of each furnace during each heat of every day.

After the gears are thus identified, the screw holes and rivet holes are plugged with fire clay so as to prevent the carburizing mixture from coming into contact with anything other than the surface. Together with this secret carburizing mixture the gear blanks are then packed in hollow center round fire pots, the tops of which are luted on with fire clay so as to make the pots practically hermetically sealed. These pots are then put into the furnace which has been brought up to a certain temperature, and the heat treating process has been started.

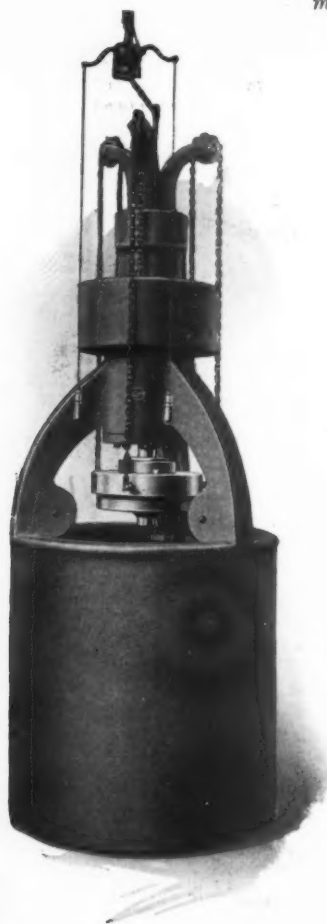
It must be understood that the results obtained by this heat treating—that is, the laying of 1-32 of an inch hard surface and the retaining of a comparatively soft, tough, strong core—is accom-

*Testing department
where bevel gears and
pinions are tested for
quietness*





Case hardening and heat treating department—carburizing pots at right



Gleason tempering machine—Straightens gears while hot

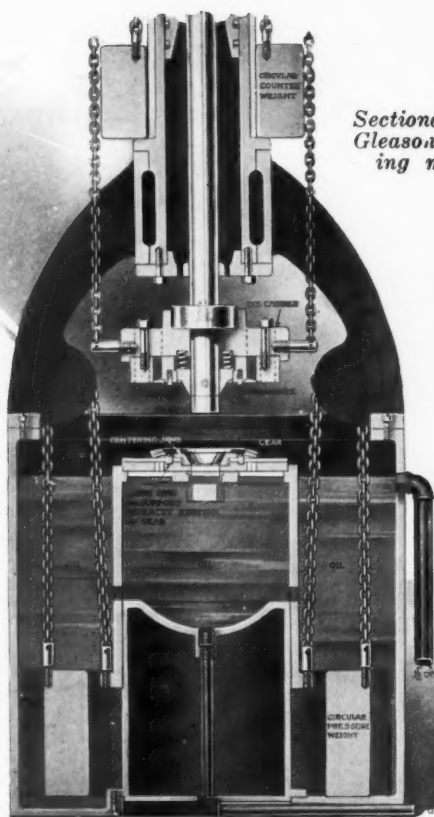
plished by driving carbon into the surface of the gear while it lays in the carburizing mixture in the furnace.

As a matter of fact it is the gases generated inside of this hermetically sealed fire pot that do the work. When the rough blank of a carbon steel gear is brought to the heat treating department it is uniformly of about .20 carbon from center to surface; when it leaves the heat treating department the center remains substantially the same with a very slight variation to both surfaces, while the surfaces themselves to a depth of 1-32 of an inch must contain 1.00 carbon.

Heat Measured

A somewhat homely analogy to the heat treating of metal is that of baking bread. The molded loaves are placed in the oven and the fire is maintained at a certain heat for a certain length of time. If the oven be too hot the outside of the bread is hard and the inside is raw. If it be too cool and if it required too long a time to bake the bread, it is heavy and unsatisfactory in every way.

And just so with the heat treating of metal, only to an unlimited greater degree. Years of experience and experimentation have shown metallurgists just the best method to follow to produce given results, and where our bread-bakers only look at the oven once or twice during the baking, there is the most accurate and most absolute check kept on every furnace during every minute of its work—and here it is that the real heat treating takes place.



*Sectional view of
Gleason tempering
machine*

Connected to each furnace is an electric heat registering device known as a pyrometer. This is really an electric thermometer so constructed that it registers the heat of the furnace either at the furnace or many feet away from the furnace.

In the Brown-Lipe plant each furnace pyrometer is connected with a registering device in a room in one end of the building, before which sits an operator whose sole duty is to read and record the temperature of each and every furnace every five minutes during the carburizing process, which averages about 7 1/4 hours.

Just let that thought sink into your mind deeply—every five minutes of all this time an absolute record is made of the condition of the furnace. This operator knows that when the metal was first placed into the heating furnace that it registered a certain temperature, and it is his duty by these five minute checkings to see that the temperature of that furnace is constantly and steadily raised a certain number of degrees at certain regular intervals until at the end of the time necessary to complete the heat, a certain fixed temperature shall have been attained.

In other words, it is his duty to see that, if the temperature of a certain furnace at starting is 1185 degrees F., after the doors have been closed and the fire commences to work regularly, that furnace shall continue to

increase its heat a few degrees at a time, until at the end of 2 1/2 or 3 hours according to his instructions from the metallurgist in charge of the operation, the heat in that furnace shall be 1600 degrees F., without the temperature ever having fallen backward during the process of raising it.

And in the watching of this operation this furnace is not allowed to vary over 10 degrees one way or the other. As the operator looks over his charts, if he sees that one furnace is not rising as fast as it should, or is rising too fast—that is, if the variations are 10 plus or minus from the curve which the heat should follow, he immediately notifies the man in charge of the furnace. If there is still a variation, the foreman is notified, and in turn the metallurgist himself in charge of the plant is informed and consulted.

After the gears have been properly carburized they are drawn from the fire and quenched in an oil bath, the oil of which is held at a certain definite temperature by an efficient cooling system. This treatment is for the purpose of refining the core or the central tough portion. Then when the gears are cooled to the temperature of the bath they again are heated up uniformly to 1425 degrees F., for the purpose of refining the hard shell or case which has been left in a very crystalline condition, due to the high heat used in refining the core.

Occasionally it is found that the gears in the process of case hardening warp out of true. To compensate for this warping such gears as have been found to be warped are straightened while hot in the quench bath by means of a newly devised straightening machine used for that purpose. The heat treatment completed, the gears are then sent to the testing department in the heat treating shop, and most thoroughly and carefully tested almost tooth by tooth to



*Fractured gears
showing case
hardening
results. Lower
piece faulty—no
case hardening.
Upper piece good.
Note hard strip
around edges of
fracture at right
of good gear*



Spiral bevel drive differential partly disassembled and spiral bevel drive pinion

which is known as the fire end. To insure absolute uniformity and exactness of temperature, these fire ends are changed on every pyrometer every Saturday so as to eliminate any possible danger of undue wearing or leakage of current of any sort.

These new fire ends, previous to being placed in the furnace are standardized against a Bureau of Standards Couple which is gotten out in Washington, D. C.

be sure that the proper amount of hardness and the proper depth of hardness have been obtained.

Just another little instance in connection with the accuracy employed throughout this heat treating department. We wish to refer again to the question of the pyrometer. These pyrometers operate on the principle that when you place two different metals in contact—for instance, copper-nickel alloy and iron—and apply heat at the point of contact, an electrical current is set up. In these pyrometers, therefore, there is a contact so constructed, which goes inside of the furnace and

From the recording station to the fire end of the Brown-Lipe heating plant is a distance perhaps of a hundred feet, and wires connected with the pyrometers at the far furnaces must be carried up to the other end of the building to the recording table.

Ordinarily electricity is conducted through copper wires, but in the conducting of the temperature variations from the pyrometers in the Brown-Lipe furnaces to the recording table, a condition arises, so minute in importance to the average lay mind as hardly to be realized, that calls for a change in this general practice of





*Inspection department
—differential cases be-
ing tested for concen-
tricity*

*No matter over what
diameter inspector lays
this level the back face of
the bevel gear must be
level to .001 of an inch*

conducting the current by copper. As we have stated before, whenever and wherever two different metals are united in the presence of heat, an electric current is set up, and in these pyrometers copper and iron are united in the furnaces to set up this electrical current. Now, then, if another union of copper and iron were made to the iron terminal of the pyrometer outside of the furnace—as would be the case if a pair of copper wires were used to transmit this current from the furnace to the recording table—a counter current would be set up at the second point of contact of the copper wire with the iron. So,

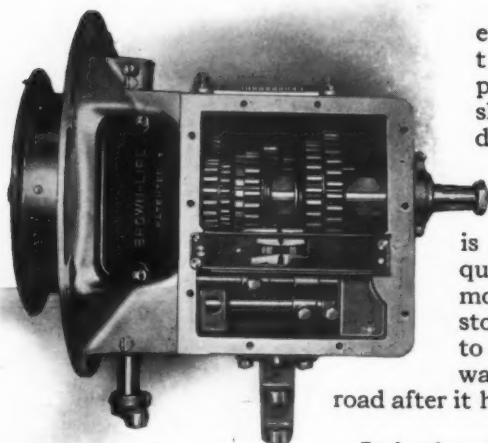
to avoid even so minute a variation as might be occasioned by this second junction of copper and iron even at a very low temperature, and which would be small, a special insulated iron wire is carried straight through from the pyrometer to the recording table.

Emphasis is laid upon this apparently unimportant detail solely for the purpose of carrying conviction on the point that every single possible safeguard to insure the greatest efficiency in the finished product is employed throughout the Brown-Lipe organization.

TRANSMISSIONS

As is generally known, a transmission set is a combination of gears and shafts that provide for variable speeds and variable power applications to the driving wheel of a car. The necessity for the use of a transmission set is based on the principle that in internal combustion engines the power delivered by the engine is abso-

lutely correlated to the speed at which the engine is revolving; in other words, if at 200 revolutions per minute a certain gas engine is delivering a power impulse of 3 h. p., at ten times that speed, or 2000 revolutions per minute, that engine is providing approximately ten times that power, or 30 h. p.



Transmission

In the driving of every car there are times when great power is required at slow speed, as evidenced in the starting of a car or in driving through mud or hill climbing. It is obvious that it requires more power to move a car from a dead stop into motion, than to propel that car forward on a perfectly level road after it has been set in motion.

It is also obvious that it requires more power at slower speed to drive that car through mud or up a hill than it required to drive it along a level road, and it must be borne in mind all the time that more power can only be obtained through greater speed of the engine.

To accommodate this condition the transmission is built so that while the engine may be turning over at top speed and delivering its maximum of power, you are still able to gear down the car so that it is not moving at top speed. Then, too, a device of some sort is necessary to provide for the question of reverse, or driving the car backward.

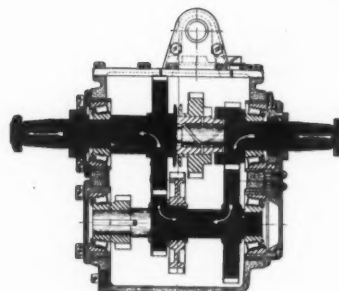
The average transmission set as exemplified in the unit power plant and multiple disc clutch construction consists, first—of the case which contains the gears and shafts. In this case is the driving gear which takes the power from the engine through the driving shaft; then there is what is called the square or rear shaft, on which are mounted two sliding gears, one of which provides the intermediate and direct speed; and the other of which operated in one direction provides low speeds, while operating in the other direction provides the reverse speed, this being a description of a three speed forward and reverse transmission.

Use of Transmission

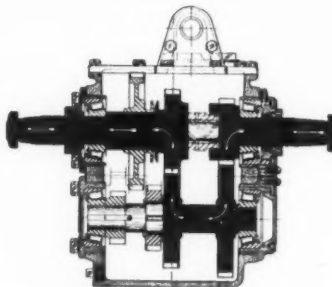
Then there is a counter-shaft which carries the counter-shaft drive gear, the intermediate speed gear, the low speed gear and the reverse speed gear. Of course, there are the bearing retainers and the various bearings which support the different shafts. Then there is what is called an idler, mounted on a stud, which is used in the obtaining of the reverse gear. The use of the transmission is very simple.

The main driving shaft is of course always revolving at engine speed, and when the car is driving on what is called "high" the wheels are turning by means of a direct transmission of actual engine speed from the crank shaft of the engine to the differential gear. When you select your gear, whether it be first or second, you simply throw out your direct connection between the main driving shaft of the car and the crank shaft of the engine through the transmission set, and interpose in the line of drive a set of gears.

An illustration of every day occurrence is seen in the bicycle. The front sprocket which is connected to your pedals,

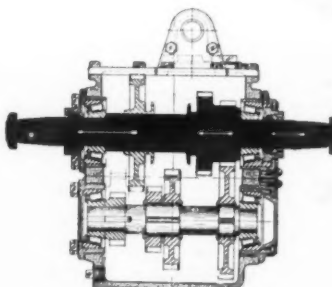


First Speed

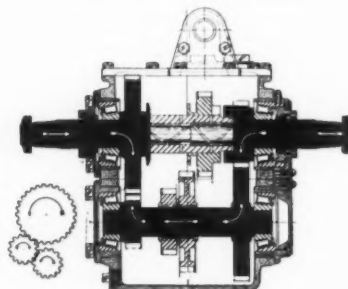


Second Speed

Solid black indicates power line. White blocks in solid black indicate gear meshing—arrows show direction of power.



Third or Direct Speed



Reverse Speed

Note that in direct the gears do not play any active part in transmitting power. In the reverse an odd gear called the idler gear is introduced in the train of gears which causes the axle end of the split shaft to rotate in opposite direction to the engine end of the split shaft

is a great big gear with a great number of teeth, while the rear sprocket—that is, the sprocket which is attached to the rear wheel—is a small gear with a small number of teeth. For every revolution that one pedal makes, or for every revolution that the big sprocket makes, the little sprocket on the rear wheel, and consequently the wheel itself, makes several revolutions. So that by turning your feet over once you revolve your wheel several times, the exact differential being direct in proportion to the number of teeth on the two sprocket wheels. Now, if you were to put your small sprocket on the pedal of your bicycle, and the big sprocket on the rear wheel—as is usually the case with trick bicycle riders on the stage—your feet would have to revolve two or three times to make the rear wheel revolve once; in other words, the power application might be identically the same at the pedals, but the speed of the bicycle would be different.

In your three speed transmission case the reverse principle of the average bicycle construction is in vogue. For very low speeds you put a gear of small size connected with the engine into operation with a gear of big size connected with the driving shaft of the car. For your intermediate speed you put this same small gear connected with your engine into operation with a smaller gear than used in the low selective,

and yet a gear which is larger than the driving gear. And in reverse you simply use three gears instead of two gears.

In the case of a four speed transmission where you get your fourth speed on what is called a "step up" you simply call into play the exact bicycle construction—that is, you use a small driving gear with a still smaller gear connected to the main shaft of your car; in other words, for every revolution of your engine the driving shaft of your car is revolving faster than the engine.

In the transmission department the general practice is, so far as the machining and heat treating operation, identical with those described under the heading of "Differentials," with the exception, of course, that in the differential department most of the gear cutting is bevel, while in the transmission department there are no bevel gears.

In the production of the transmission gears in the Brown-Lipe plant, however, there is one feature which is carefully watched, that is perhaps a little at variance with common practice. In the generating of gears several blanks are laid one upon the other, and then put into the gear shaper in such a manner that the cutting tool works up and down over three or four or more gears at the same time.

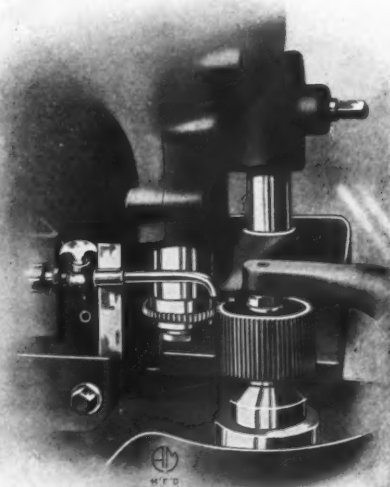


Fellows gear shapers cutting teeth in transmission gears



*Grinding department
where transmission
gears and shafts are
ground*

*Fellows Gear
Shaper showing cut-
ter at work*

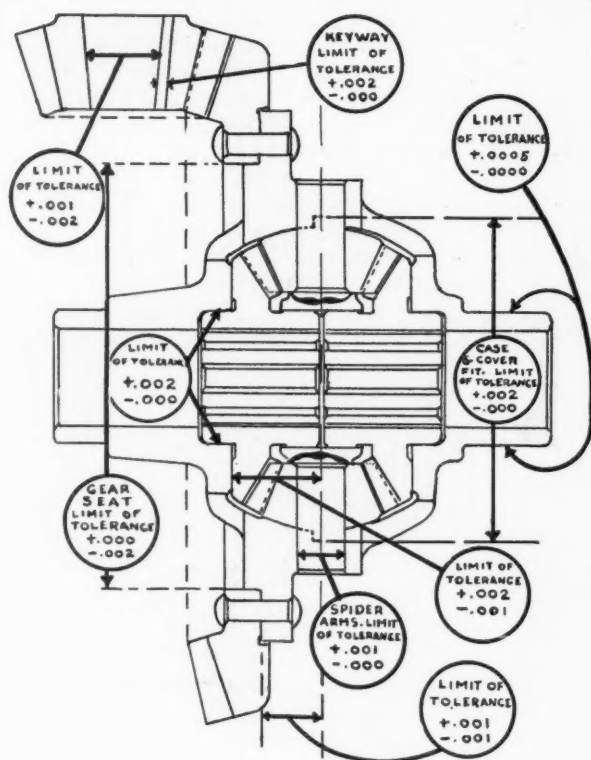


In order to have all these teeth cut at absolute right angles to the face of the gear, or in other words, to have the line of the tooth absolutely parallel with the shaft to which it is attached, the gear blank faces must be absolutely parallel and accurate. So that instead of simply assembling these blanks as they first come from the forge, all the gear faces are first ground absolutely parallel before shaping, then when they are stacked and placed in the gear shaper, the gear teeth must be cut absolutely at right angles with the face of the gear.

It is in this work—this preliminary machine work, that a very marked manufacturing refinement takes place in the Brown-Lipe Plant.

For where in cheap manufacturing this first machining operation is slighted, in the Brown-Lipe Transmission work it is held to absolute limits.

In the construction of the case in Brown-Lipe Heavy Duty Transmissions all the bearings



are mounted in malleable cages which are carefully fitted into the aluminum of the case itself, rather than being mounted directly in the aluminum. This of course is a great deal more expensive method of manufacture but by the same token it is vastly more superior and accurate.

Quality and efficiency, the earmarks of Brown-Lipe products, depend in the final analysis upon the thoroughness of the testing and inspection departments through which those products must pass.

No matter how clever a design may be, if proper materials properly machined are not embodied in the result of that design, quality and efficiency are lacking. It is, therefore, largely due to the thoroughness and completeness of the inspection departments in their checking up, not alone of materials, but of the work performed on the materials, that Brown-Lipe products stand today as unquestionably the standard upon which all competitive products are analyzed.

Throughout the machining of every part of every product working limits are enforced in the Brown-Lipe organizations that to the mind of the layman seem impossible of enforcement. The .001 part of an inch is just as much a factor in measurements as an inch itself and the very fact that the Brown-Lipe Companies enforce their workmen to hold themselves down

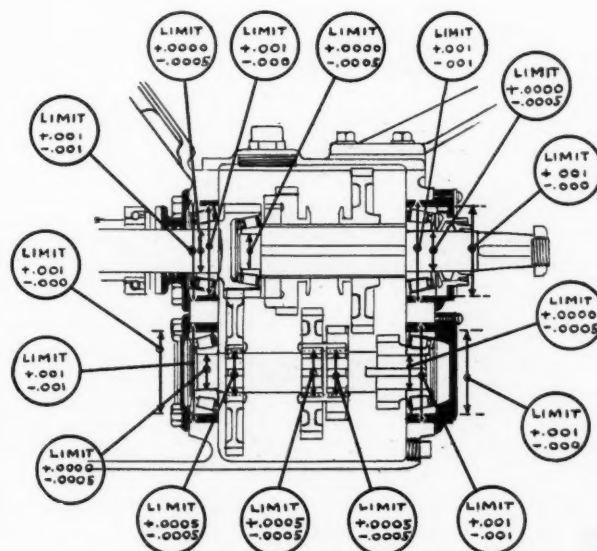
to such microscopic measurements explains in detail just why Brown-Lipe products are better products and just why Brown-Lipe products cost more ultimately as a first cost but why in the hands of the consumer Brown-Lipe products represent the lowest cost.

The illustrations on this page of the differentials and transmissions show the wonderful microscopical limits to which these products are held.

In the differential, for instance, the bevel gear seat must be machined within .002 part of an inch of the indicated measurements on the blue print. The case and cover must fit to a limit of variation of plus .001 of an inch and minus absolutely nothing. The hubs are held to a limit of plus .001 of an inch variation and in the design, wherein we press on the sleeves and grind the hubs, the variation from actual indicated measurement is held as low as .000 1-4 of an inch.

Throughout the grinding of the surfaces of the internal parts—that is, the arms of the spider; the bore of the spider; the back bore and front of the side pinions; the back and hubs of the side gears, as well as the bore of the side gears where spline shafts are used—the limit of tolerance of variation from the blue print is held to .001 of an inch.

And all these and many other measurements are held there, too, for any inspector who allows any one of these measurements to vary from its absolute limitation automatically discharges himself. And what is more, through the working out of our manufacturing plans the inspection of one man is checked by that of another.





In the transmission tolerance limits of .0005 of an inch are encountered more generally than limits of .001 of an inch. Both the main shaft and the countershaft at every bearing fit are held to the specified dimensions within a minus limit of .0005 and with absolutely no over-size. In other words, the instructions to the mechanic who finishes those shafts are that his limit of tolerance

from measurements is plus nothing and minus .0005 of an inch.

Where the aluminum case is bored to furnish a seat for the bearing cage in which the shafts are mounted, the limit is plus or minus .001, while the bore of the bearing cage itself is held to a limit of plus .001 and minus nothing.

The grinding limits for the gear fits on the countershaft are plus or minus .0005 while the grinding limit on the square shaft upon which the sliding gears slide is absolutely nothing. All gears must be concentric—the measurement of concentricity being from centre of the gear to the pitch line of the teeth—to a limit of .001 of an inch.

And so right on through the entire manufacture of every Brown-Lipe product.

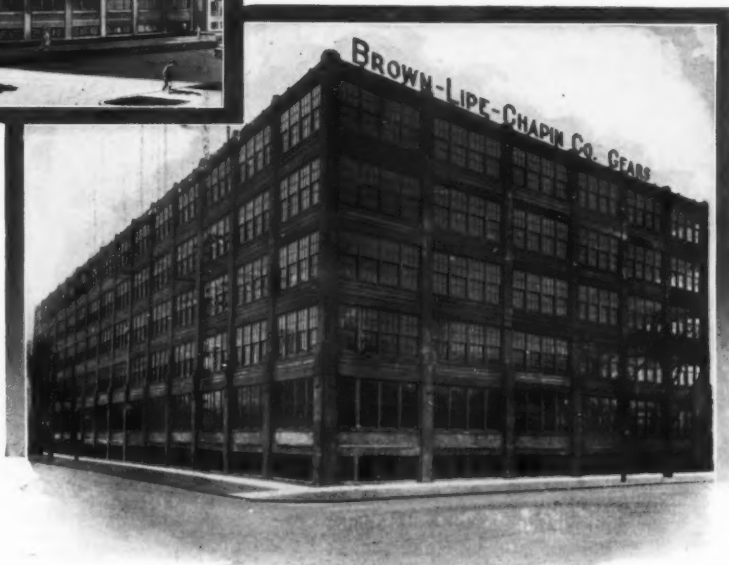
Combine these microscopical manufacturing conditions with a design which contemplates only the production of a part that will give the maximum of service with the minimum of weight and practical elimination of noise—

Combine these manufacturing conditions and this superiority of design with the fact that the metal which enters into these parts is most carefully analyzed chemically and held absolutely to the specifications we know to be best suited to the requirements—

Combine these superior points of design, workmanship, inspection and materials with the final fact that this product is treated to a degree of accuracy and perfection almost superhuman to the lay mind and you have again our reasons for claiming that

Brown-Lipe products are unquestionably the standards by which all competitive products are measured.

B R O W N - L I P E G E A R C O .
 SYRACUSE, N. Y., U. S. A.
B R O W N - L I P E - C H A P I N C O .





Trade Mark

The *NEW* BRAENDER

BULL DOG NON-SKID

*will be
exhibited
at the
NEW YORK*

(Space No. D207)

and

CHICAGO

(Spaces Nos. 189-190)

Shows



**No
side
skidding**

**Increased
wearing
surface**

LATEST TIRE SENSATION!

The Fastest, Safest, Smoothest riding and most Durable tire made

BRAENDER RUBBER & TIRE COMPANY

250 West 54th St., New York

Factory RUTHERFORD, N. J.

AGENTS

The Alfredal Co., 1467 S. Michigan Ave.,
Chicago, Ill.
Keystone Motor Supply Co., 3302 Grant
Blvd., Pittsburgh, Pa.
Motor Accessories Co., 6521 Euclid Ave.,
Cleveland, O.
Southwestern Rubber Co., 902 Main St.,
Houston, Texas.
Franklin Rubber Co., 265 N. 4th St., Co-
lumbus, O.

James Tire Co., 3328 Olive St., St. Louis,
Mo.
Dayton Tire Co., 589 Boylston St., Boston,
Mass.
Ketcham & Lawrie, 259 Halsey St., Newark,
N. J.
E. B. Quarles & Co., Charles and 20th Sts.,
Baltimore, Md.

G. H. Snyder, 465 Fulton St., Troy, N. Y.
Asheville Steam Vulcanizing Co., 5 East
College St., Asheville, N. C.
Charles A. Middelburg, Charleston, W. Va.
Stevens Hotel Co., Lake Placid, N. Y.
J. R. Johnson, Greenwich, Conn.
Gross Hardware Co., 126 Grand Ave., Mil-
waukee, Wis.

Please mention The Automobile when writing to Advertisers



WITH the occupation of our latest additional manufacturing space the Eisemann Magneto Company is in position to assist American manufacturers by assuring them prompt deliveries in taking care of rush orders. Within the last week this ability to make prompt shipments was demonstrated in the case of a big truck order the acceptance of which was predicated practically upon our ability to make almost immediate shipment of a special lot of instruments. We made good and the order was closed.

Needless to say the vast increase of capacity has affected the quality of the Eisemann output only to the extent of making it stand out more prominently than ever in its admitted superiority. The reconstruction of the factory, made necessary by the first enlargement last summer, brought about the installation of better and more advanced machinery which made possible the production of the greatest advancement known to the ignition world—the new Eisemann Type G-4 single ignition,





waterproof, high tension magneto. Simplicity personified is the keynote of the construction of this new Eisemann product. It is the most accessible, most efficient instrument that has ever been produced, and we are willing to base our contracts on actual tests of this literal statement.

The principal features of simplification are to be found in the new contact breaker which is patented; the method of carrying the high-tension current direct from the collector ring to the distributor without the use of unnecessary brushes and conductors; the method of attaching the cables inside of the magneto and a general elimination of parts by a remarkably clever new design.

And in the increased simplicity and accessibility this new model has also gained much in efficiency. Waterproof, dustproof and practically foolproof, it is the greatest step forward yet recorded by the Eisemann Company in the maintaining of its reputation for efficiency, reliability and durability.

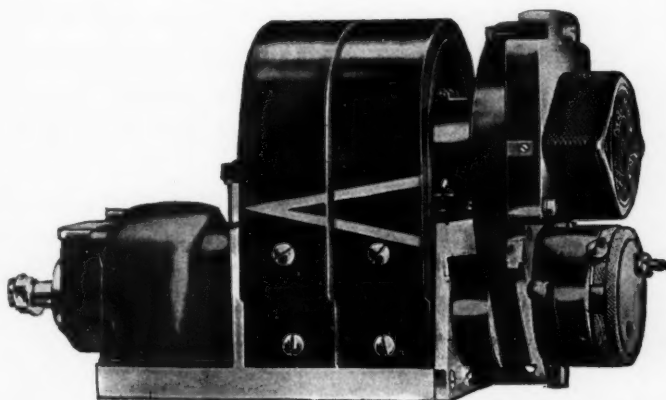
The Eisemann Magneto Co.

Sales and General Offices: 32-33d Street, Brooklyn, N. Y.

NEW YORK:
245 West 55th Street

INDIANAPOLIS, IND.:
415-417 N. Capitol Avenue

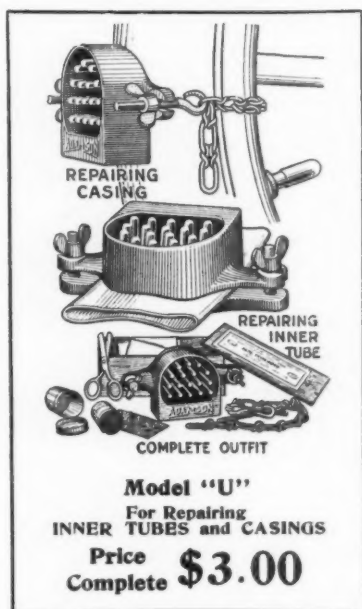
DETROIT, MICH.:
802 Woodward Avenue



WAR IS HEL=pful!

—to **ADAMSON** Dealers.

Let's put an **ADAMSON** Vulcanizer in every
"See America first" Kit!



THOUSANDS of people who have been "kiting" away to Europe for their vacations—to "see the sights"—will now stay at home and SEE AMERICA. Many of the better classes of people will be attracted from abroad. We will become the commercial, the educational and the sight-seeing nation.

Let's Capture the Added Domestic Business This Means For Us

Can we not—together—put an ADAMSON Vulcanizer in every "See America First" automobile kit?

There will be more overland travel in the United States—for some time. Motorists will need just the sort of service an ADAMSON Vulcanizer provides.

There is a tendency to economize which, while it may reflect itself in some lines adversely, means **YOUR** opportunity when it comes to selling Vulcanizers—for Adamson Vulcanizers *save many tire dollars*.

If you sell less of one thing—you can sell more of another! We hope that **EVERYTHING** is moving out lively! But if you want to create still more activity—get busy with ADAMSON Vulcanizers.

ADAMSON MANUFACTURING COMPANY

Hamilton, Ont., Canada

East Palestine, Ohio



National
SIX
\$2375

THIS is the
Reason why
National Deal-
ers stick to this
Line of Cars!



National Motor Vehicle Co., Indianapolis, Ind.

Please mention The Automobile when writing to Advertisers

You will save enough on tires in a year, because of proper inflation, to more than offset the cost of the

MANZEL ENGINE DRIVEN TIRE PUMP **MANZEL**

A pump at \$20 that does the work of tire inflation with the absolute minimum of effort on your part, that pumps to the efficient limit dictated by the size of your tires, and then automatically shuts off the air supply, preventing over-inflation, with resulting blowouts, and damage to your tubes and casings.

It is easy to install—"a screwdriver, a file and a wrench"—these are the tools you need, and you don't have to pay a mechanic to put it on for you. Once on it's on to stay. It weighs less and occupies less space than any other pump of the same capacity.

When you want to use it, simply couple on your hose connection, throw your pump gears into mesh, start your engine, and sit back for two or three minutes—your tire is inflated to the efficient pressure determined by its size, and then our unique safety valve takes off the

MANZEL BROTHERS

Factory and General Sales Offices,
Leaders, for 16 years, in the manufacture of quality oil

DISTRIBUTING CENTERS:

Albany
Albuquerque
Atlanta
Baltimore

Billings
Birmingham
Chicago
Cincinnati

Cleveland
Denver
Dallas
Detroit

Des Moines
Ft. Worth
Houston
Indianapolis

Kansas City
Louisville
Milwaukee
Minneapolis

Memphis
New Orleans
New York
Omaha

pressure and prevents over-inflation. Even the air is purified—dust, grit, oil and particles of foreign matter are filtered out at the intake.

The whole operation is predetermined with scientific accuracy in the design of the Manzel Pump. Its two cylinders insure absolutely even pumping—a uniform air supply, without jar, jerk or backlash that marks the single-cylinder pumping with its resulting damage to gears and disturbance of magneto timing.

The Manzel pump is a perfect piece of mechanism in itself—accurately fitted, precisely machined; aluminum crankcase, phosphor bronze connecting rods and bearings; fine gray iron cylinders, pistons and piston rings—in fact, everything in its composition and machining has the stamp of highest quality.

The design is at the same time most efficient and most economical, and the combination makes a pump that is a big money-saver to you at \$20—and it's the same pump, plus further refinements in detail, that thousands of motorists gladly paid \$28 and \$30 for last year.

Your dealer undoubtedly stocks Manzel Two-Cylinder Engine Driven Pumps. If not, order from us direct.

We carry in stock Fittings for the following cars:

Abbott-Detroit, Buick, Cadillac, Cartecar, Case, Chandler Six, Chalmers, Cole, E.M.F., Franklin, Hudson, Imperial Six, Kissel Kar, Maxwell, Michigan, Mitchell, Oakland, Oldsmobile, Overland, Packard, Paige-Detroit, Rambler Cross Country, Reo, Simplex, Speedwell, Studebaker, Stutz, Velie, and others.

COMPANY

308 Babcock St., Buffalo, N. Y.

pumps for heavy duty steam and gas engines.

Portland, Me.
Providence
Portland, Ore.
Philadelphia

Pittsburgh
Richmond
St. Paul
St. Louis

Salt Lake City
San Francisco
Toledo
Washington, D. C.
Wichita

Here's the Pump

Weight, 7 Pounds

Half
Actual
Size

Retail Price

\$20

Complete with all fittings, including 15 feet of air hose, pressure gauge, etc.



Please mention The Automobile when writing to Advertisers

APELCO



AMMETER

APELCO electric starting and lighting outfits—both single and double unit systems—are strong features of the 1915 season. While simplicity has been kept foremost in APELCO products, construction in every detail is such as to withstand the most severe test of automobile service.

In combining the motor and dynamo into one unit as practiced on *Mitchell, Briscoe* and other cars, not only compactness is secured, but a design lending itself to an easy application to the automobile engine. Acting as a motor, the machine has sufficient power to *spin* the engine at a good rate of speed. As a generator it has capacity to keep the battery fully charged, insuring ample current for starting, lights, ignition, horn, etc.

In the two unit APELCO system, motor and starting switch form the one and generator and timer distributor the second unit. An important feature embodied in the generator unit is the method in which the generator and the driving bracket are connected. The complete generator can be removed for any care or attention without disturbing the ignition system. The drive from engine is by a combination of spiral gears that insures noiseless running. The starting motor in combination with the starting switch is small and compact, automatic in action and positive in practice.

The entire self-controlling mechanism of the new LIGHTING GENERATOR is contained within its housing and but one pair of wires need be run from the generator to the battery. The movable element is independent of dash-pots, liquids, frictional devices, pivots, oil, grease, graphite and shocks on the road.

In both single and two-unit APELCO systems, the Indicating Automatic Switch is mounted in the circuit between dynamo and battery. Its function is to make connection between these two units when the voltage of the dynamo exceeds that of the battery as well as break connection when the battery voltage exceeds that of the dynamo.

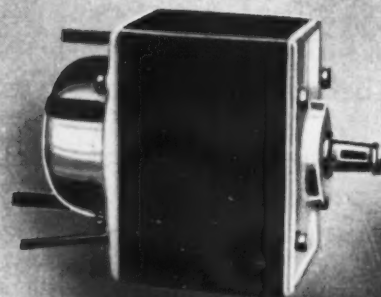
The AMMETER is a new comer, designed particularly for automobile service and creates special interest by reason of the fact that violent jarring, due to vibrations of the dash-board, cannot affect it as regards accuracy and mechanical stability. Here again reliability and efficiency are the keynotes.

Study our exhibits:

New York Show: Space C, 60-73
Chicago Show: Space 59

THE APPLE ELECTRIC CO.
NEWARK, N. J.

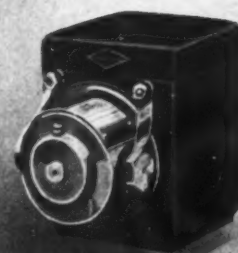
(All APELCO features are fully covered
by patent or patents pending)



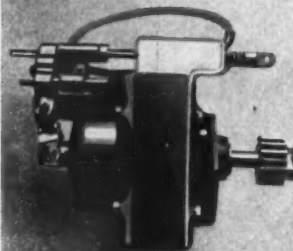
MOTOR
AND
DYNAMO
IN ONE UNIT



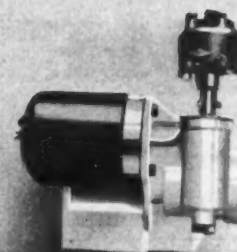
AUTOMATIC
SWITCH



LIGHTING
GENERATOR



MOTOR
AND
STARTING
SWITCH



GENERATOR
AND
TIMER
DISTRIBUTOR

About 25 feet of
Famous Yellow
Strand Power-
steel Wire Rope

Autowline Weighs
only 4½ Pounds

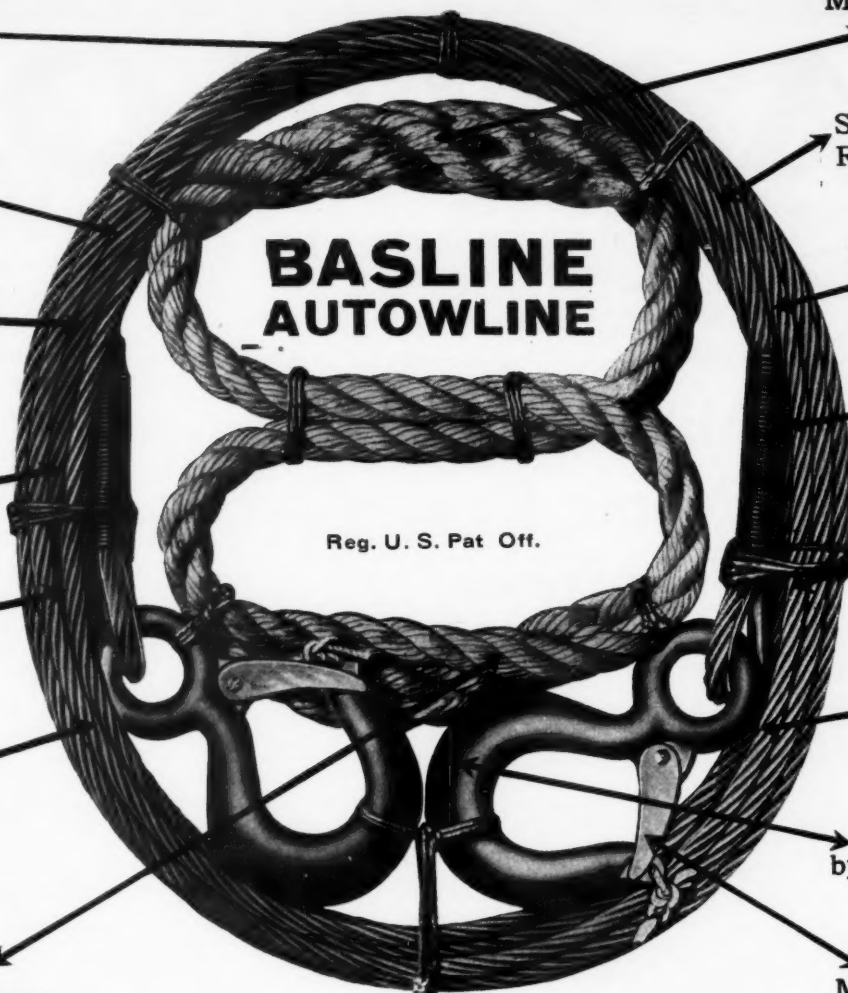
Pulls 4000 Pound
Car up 20% Grade

Clean, Neat,
Compact

Coils flat
under Cushion

Not Bulky
Like Manila Rope

Manila Slings
prevent bending
and breaking wire rope



Manila Slings Prevent
Marring Paint

Stood Every Test on
Recent Official Tours

Starts Stalled Wheel
on Own Power

Illustration about
Half Reduction

Put Autowline
Under Your
Cushion Today

Sold by all Live
Accessory Dealers

Attached Instantly
by these Snaffle Hooks

Snaffle Hooks Hold
Manila Slings Securely

**BASLINE
AUTOWLINE**

Reg. U. S. Pat. Off.

If These Arrows Won't Convince You— Basline Autowline Will

AUTOWLINE has convinced hundreds of other careful car-owners that it's as important to their safety and peace of mind as a spare tire. That's why Autowline is always in their cars, winter and summer,

Basline Autowline

will convince you, too, the minute your accessory dealer shows you this wonderful "Little Steel Rope with the Big Pull." Have him show you one this very day!

Buy it for \$3.95, east of the Rockies. Then you'll always get a tow home when your engine goes dead, 15 miles from anywhere—and you can help a brother autoist out of the ditch some other time.

Basline Autowline is under the cushions of cars owned by officials, past and present, of the A. A. A.

Truck Autowline, a grown-up brother of Basline Autowline, is ideal for heavy towing. Get one for each truck. \$5 F.O.B. St. Louis.

**FREE — Write
today for the
fully-illustrated
Autowline
circular**

Autowlock locks wheel to spring or spare tire to rack. Thieves can't clip Autowlock without shears with 2-foot handles. At your dealers. \$2 east and \$2.25 west of the Rockies.

Broderick & Bascom Rope Company

815 No. 2d Street, ST. LOUIS, MO.

New York Office, 76-F Warren Street

Makers of Celebrated Yellow Strand Powersteel Wire Rope

Please mention The Automobile when writing to Advertisers

MARMON

Marmon 41 Makes 62.89 Miles in 1 Hour NEW RECORDS WITH MARMON STOCK CAR.

MARMON SETS NEW STOCK CAR RECORD

Is Driven 1030 Miles in Fuel Test and, Carrying Five Passengers, with Top and Shield Up.

Windshield Up. Makes 62.89 Miles in One Hour.

MARMON STUNTS AT INDIANAPOLIS

Big Car Makes 1,000-Mile Test on Zoli Fuel—Breaks All Touring Car Records in Sustained Speed Trials, Fully Equipped.

Certified stock touring car records were established today on the speedway by a Marmon 41, which covered 62.89 miles in 1 hour, carrying five passengers and with top and windshield up. The test was made under special sanction of the American Motor Age.

MOTOR AGE

Another Marmon High-Speed Record.

On October 12, a Marmon "forty-one" touring car was driven from San Francisco to the Lick Observatory, on the trip being made on high gear. The car was made from San Francisco at 67 on October 12. Three hours later climb up the foot hill road to the longest and most difficult of California, rising to a height of twenty-one miles of what is the most winding road in the last 365 turns in the last 365 miles of the trip.

November 19, 1914

Thousands of Experts Read These

THE AUTOMOBILE
PUBLISHED
Vol. XXX Thursday, November 19, 1914
THE CLASS JOURNAL
Horace M. Sweetland
W. I. Ralph, Vice-President
231-241 West 39th Street, New York 14

BEATS MILE-A-MINUTE MARK
Marmon Stock With Top Up Carries Five Passengers.

Word has been received from Editor Howard I. ...
F. B. Barnard, ...
Guy W. Mc ...
Cable Address ...
Long Distance Telephone ...
United States ...
Other Countries ...
To Subscribers ...
Post-Office ...
Entered at New ...
Member of the ...
The Automobile ...
Review ...
and the Automobile Magazine ...

From Report to Reality

SIXTY miles per hour in a stock touring car, with top and windshield up and with a load of five passengers, is no longer confined to the realm of conjecture or salesman's arguments but has become an official reality, by the Marmon speedway test in which a registered stock car traveled over 62 miles in the hour on the brick speedway. This performance is the best attribute to progress in automobile engineering in America and is one of the most applicable answers to those critics who ask, "How permanent has been the progress of the last 5 years?"

It is scarcely that long ago that a prize was offered for stock touring cars with load and windshield up that could travel a mile in 60 seconds going one direction on the speedway or road and then travel in the opposite direction and make 60-mile-an-hour pace for a distance of 1 mile. The makes of cars then foremost in the racing world tried but made signal failures. Today, while but one make has officially performed the feat of not only going 1 mile but 60 at a sustained speed, there are doubtless several other makes that could show a sustained speed of over 60 miles per hour.

Sustained speeds of this rate show that improvements have been at work in many parts of the machine in lightning, balance, accuracy as practiced by car makers

Great Care in Manufacture of Parts and Assembly Afterwards Necessary to Get Best Results
—Marmon's System Explained and Illustrated

CHICAGO SHOW — JAN. 23-30 — SPACE H-2
NORDYKE & MARMON CO. (Established 1851) INDIANAPOLIS, INDIANA

"OVER SIXTY YEARS OF SUCCESSFUL MANUFACTURING"

Please mention The Automobile when writing to Advertisers

Stock Car Mark Established by Marmon on Speedway

With Five Passengers, Top and Shield Up, Model 41, Does 62.84 Miles in 1 Hour

The Technical Press reflects the true position of a manufacturer's product.

Read what these excerpts say—

Then again we ask the live dealer this question—

How would you like to sell a car that you could say to your prospect—"Go out and get the best and most wonderful demonstration in the world, try all the cars and when done come to me—if I can't excel—mind you, beat them—I don't want your money."

Get the Marmon Dealers' Proposition.

Marmon makes record from Tahoe to San Francisco
him h A. E. Morrison, Western manager of the Nordyke & Marmon
The Company, made the trip from Tahoe Tavern to the
ring Creek Road.

Accuracy as Practiced by Car Makers

Marmon Will Try Speedway Test Records

The firm determination of beat-possible, the Cole and Packard, great performances on the speedway, the Haynes Automobile Co. of Kokomo, Ind. and the Marmon Co. of Indianapolis.

Marmon is There
There, now, let some one else try it!"

That was the statement F. E. Wing, New E of the Marmon cars, made when he landed Wednesday, after one of the most notable moto model in this country. He had just completed the speed shift lever.

A Excellent Record
Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

Marmon Co. Indianapolis

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Marmon Co. Indianapolis

Marmon Co. Indianapolis

See
this Advt.
Collier's
Weekly
Jan 9th 1915

And the Very Next Minute—?????



A 40 H.P. Engine versus What (?) H.P. Brakes?

You *know* your car's *engine* power. But *what* do you know about its *braking* power? Can you swear that your brakes won't fail you in a pinch?

Probably you don't know just how your brakes are lined. Too few drivers do. But for Safety's Sake mark this: if the brake lining on your car gives you less than 100% gripping power, *you flirt with disaster every day you drive.*

Thermoid

HYDRAULIC COMPRESSED Brake Lining - 100%

Many automobile owners do not even know that brakes are *lined*. Of those who do, few could tell you what with.

You—and thousands of others—investigate engine power carefully. Axles; tires; extras; lighting and starting systems; all are studied

Every necessity and convenience for putting and keeping the car in *motion* endure your mental acid-test.

Yet most men—perhaps YOU—neglect that all-important factor, brake lining, on which *brake reliability* depends.

Of course it's annoying when your car won't start. But—it is dangerous when it won't *stop*!



Leading automobile manufacturers protect you to their best ability by equipping with good brake lining. (Thermoid is used on more high-grade cars than all other linings combined.)

Thermoid Rubber Company, Trenton, N. J.

Our Guarantee: Thermoid will make good—or we will

But the best brake lining will wear away in time. *Less* than the best loses its friction power long before it is all gone.

You must protect yourself.

When you buy a car, insist that it be Thermoid-equipped. If you have driven your car a time, have the brake lining tested. When it comes to re-lining, demand Thermoid. In that way you can be sure.

Brake lining, to be 100%, must be brake lining all through. Not merely on the outside. You trust it with your life. Hence, it must be trustworthy to the last.

Thermoid retains its 100% gripping power even until worn *paper-thin*. Hydraulic compression makes it one solid, single substance of uniform density clear through—instead of being loose and stringy (and friction-shy) on the inside, as is ordinary woven brake lining. Cut a piece of each open. You will *see* the difference.

Thermoid cannot be burned out nor destroyed by any heat generated in service. It cannot be affected by oil, water, gasoline, dirt. Its wearing-life is greater. It contains 50% *more* in actual material.

No man knows how many accidents Thermoid might have prevented. We can only urge you to guard YOUR safety with Thermoid.



**When You Must
Stop Your Car,
Trust Thermoid.**

Follow the Buying Crowd to the New Oakland At Automobile Shows Everywhere



See the New Oakland— *You'll want to drive it.*
Drive the New Oakland— *You'll want to own it.*

The 1915 New Oakland is fully a year in advance
as to Power, Light Weight, Strength and Design.

The New Oakland Dealer has the edge
on all other
dealers.

**Fours
and
Sixes
\$1100
to
\$1685**

F.O.B.
Pontiac, Mich.

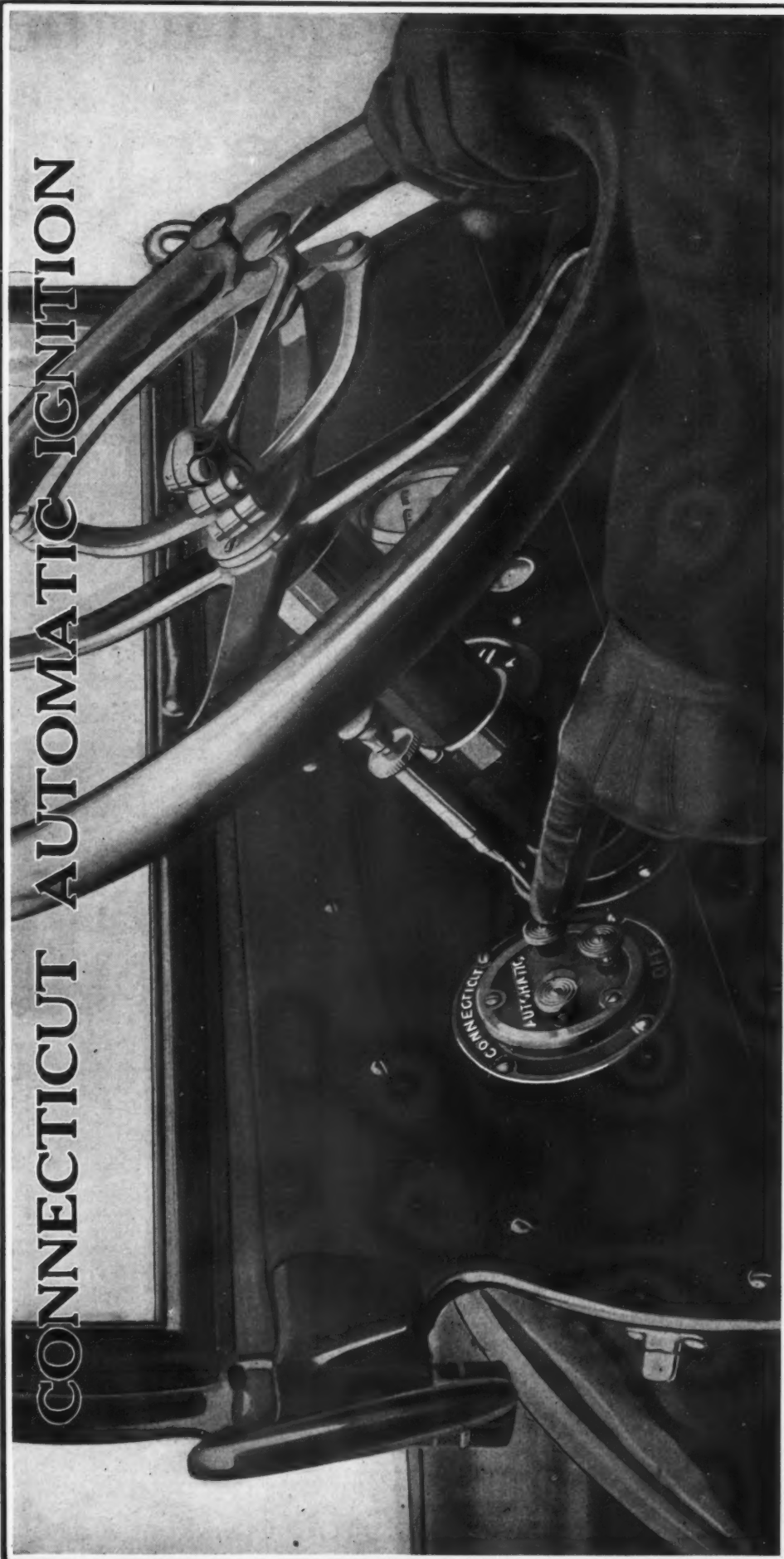
Light Weight with Great Strength—
High Speed Motor with Great Power—
Low Center of Gravity with usual Road
Clearance—
Racing Car Lines, assuring Minimum
Wind Resistance.

DEALERS Investigate the new Oakland contract. It's
fair, square and profitable.

OAKLAND MOTOR CO., Pontiac, Mich.

Branches and Distributors in all Principal Cities

Please mention The Automobile when writing to Advertisers



CONNECTICUT AUTOMATIC IGNITION

The Sign of Unqualified Efficiency

The storage battery of a starting and lighting system is charged by a generator, which is equally as dependable and as inexhaustible a source of current supply as the magneto's. This Generator always provides an abundance of current for ignition, over and above that required for starting and lighting.

With Connecticut Automatic Ignition on your car, you can be sure of two things—

First:—Your ignition system is far superior to the magneto and better than any of the modern battery ignition systems.

Second:—Your ignition is not only better than

any of the others but it tempers its output to meet the needs of your car's motor for every phase of driving.

Connecticut Automatic Ignition includes every advantage of other forms of ignition and is free from the limitations to which other systems are subject.

Little Difference in Cost

So when your car is equipped with this system, and whenever you see the Connecticut Automatic Switch on the dash you can be sure the maker of your car has given you unqualified ignition efficiency.

Why compromise with an inferior equipment when the difference in cost is so little? The ideal adaptation of Connecticut Automatic Ignition is in conjunction with a generator supplying current to a storage battery for lighting and starting.

The Connecticut Automatic Igniter System is fully as great an improvement over the present day magneto as the magneto was over the old-time vibrating coil.

More Effective Spark at High Speed Than Magneto

The Automatic Igniter produces its hottest spark on the slowest speeds whereas the magneto spark is weakest on slow speeds and hottest at high, but even so the Igniter will give a more effective spark on the high speed than the magneto and on medium and low speeds there is no comparison.

Material Saving When Electric Starters Are Used

On cars equipped with electric starters and in fact for any kind of starting, it will be readily appreciated what an advantage the Automatic Igniter with its hot spark will be over any other form of ignition.

When electric starters are used the saving on the Battery will be very material.

Simplest System of Ignition Thus Far Devised

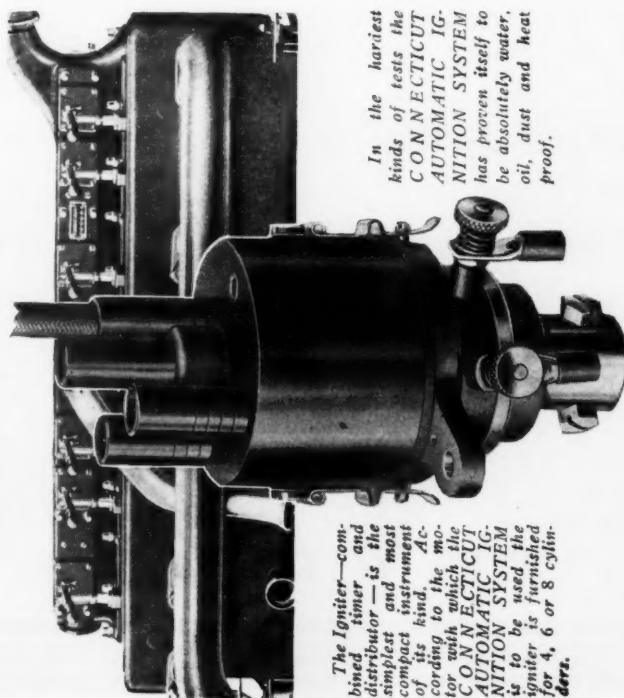
A hot spark is most necessary when throttled down in traffic or otherwise, or when hill climbing with a heavy charge of gas. Under these conditions the difference over the magneto turning over slowly and producing its weakest spark is most noticeable. It is the simplest system of ignition thus far devised and can be quickly understood by the average garage man.

No other battery ignition system can approach Connecticut Automatic Ignition in efficiency, for the closed circuit types have the fatal weakness of being unable to protect their ignition source against draining. Mechanical and electrical lag are ever present in relay and instant contact type systems—either or both are fatal to synchronism. This kind of ignition cannot graduate the quality of its sparks to meet conditions of carburetion, starting, slow running, hill climbing, etc.

CONNECTICUT & ELECTRIC
TELEPHONE COMPANY, Inc.
MERIDEN, CONN.



This is the transformer coil which carries the primary and secondary windings. While the points in the breaker-box are closed the primary coil is being saturated. When the primary circuit is broken induction sets up a high tension current in the secondary winding.



The Igniter—combined timer and distributor—is the simplest and most compact instrument of its kind. According to the motor with which the Connecticut Automatic Ignition System is to be used the igniter is furnished for 4, 6 or 8 cylinders.

In the harshest kinds of tests the CONNECTICUT AUTOMATIC IGNITION SYSTEM has proven itself to be absolutely water, oil, dust and heat proof.

The relative superiority of one ignition system over another amounts to very little unless it reveals itself in the performance of the motor, its starting, idling, hill climbing, fast running and in a hundred and one other ways.

The relative superiority of CONNECTICUT AUTOMATIC IGNITION is so conspicuous that the most inexperienced driver feels it at once in the snap and vim it engenders.

Please mention The Automobile when writing to Advertisers

THREE STRAIGHT

The **ZENITH-EQUIPPED** Hudsons
Win the Annual Harrisburg Economy Contest
for the Third Year in Succession.

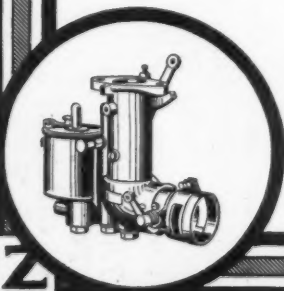
1st Prize: Hudson 6-54, 21 Miles per gal.

Carried 7 passengers and weighed 5750 lbs.
Averaged 30 miles per hour and fastest time.
Course very hilly with stiff head winds.
Leading Six and Eight cylinder cars competed.

3rd Prize: Hudson Light Six, 22.6 Miles per gal.

Carried 7 passengers and weighed 4425 lbs.
Ran over same course of 111 miles.
Beat every car of its class in contest.
Perfect mechanical scores for both Hudsons.

There were no Zenith representatives present—no possibility of altering the non-adjustable Zenith during the run. It was one more "Bullseye" for the famous Compound Nozzle.



ZENITH CARBURETOR CO.
DETROIT, U.S.A.

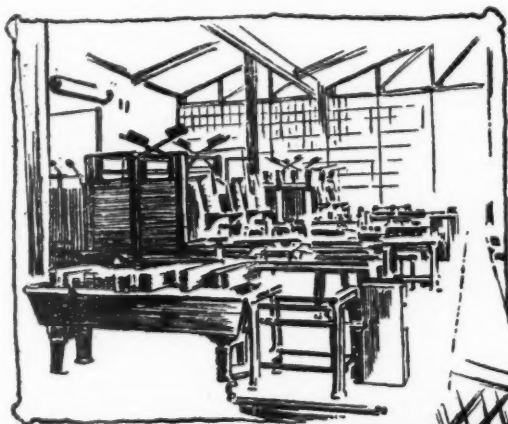


SHELDON

TRADER confidence in a product is the greatest asset any organization can acquire. We have always known this and it is our policy to conserve such an asset. The policy which has been so successful in building up the trade confidence in SHELDON Products as it exists today, will be continued in the future, and with our resources, facilities and organization, we believe that we can not only materially increase the existing prestige of SHELDON Products, but make the name SHELDON a valuable asset to the manufacturer who builds SHELDON Parts into his vehicles and to the dealer who in turn sells the finished vehicles which incorporate one or several of SHELDON Products.

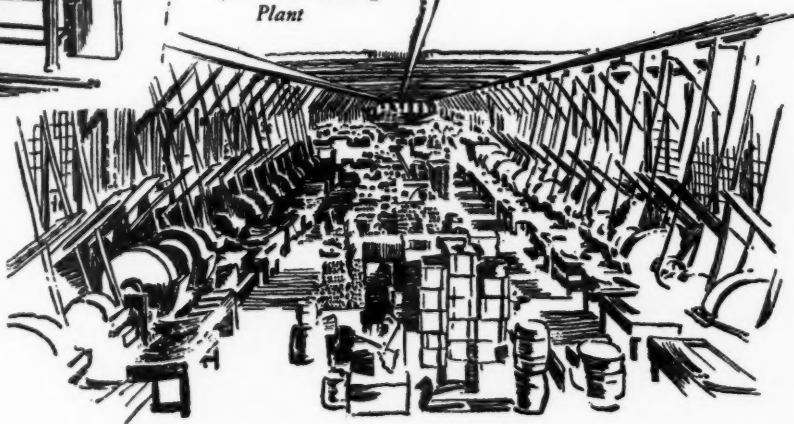
The insurance of quality in SHELDON Products gets its root in the executive branch of our organization.

Ours is essentially the product of engineers and the designing, experimental, manufacturing, testing and selling branches of our business are under the direct supervision of a corps of engineering specialists second to none in the world in their skill, experience and practical comprehension of their respective lines.

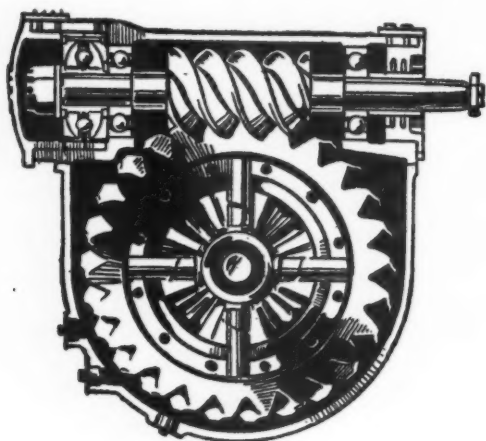


*Corner in
Heat Treating
Plant*

The equipment of the SHELDON AXLE AND SPRING COMPANY'S plants is modern to the last detail.



*One Section of
Spring Grinding
Department*



SHELDON

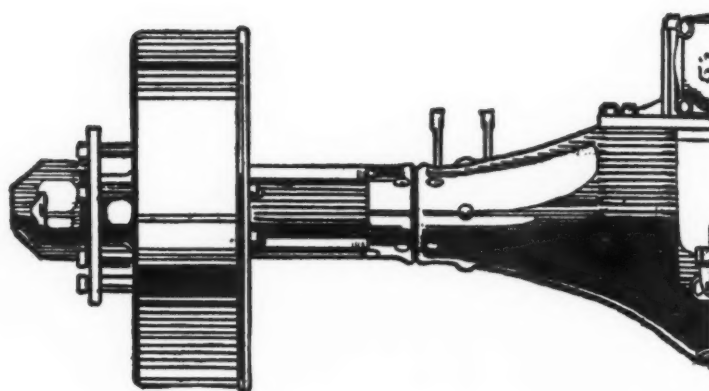
WORM GE

SHELDON'S preference for the worm gear type of axle is based on efficiency of that type of final drive. So thoroughly and so practically have our engineers gone about the design and manufacture of worm gear rear axles that they have produced a type of worm gear drive that transmits to the wheel from 94 to 97% of the power applied.

Efficiency, not manufacturing expediency, dominated our preference for ball bearings to take both radial and thrust loads as they appear in a rear axle.

Our preference for the semi-floating type of axle construction is based upon strength and service alone. We believe, and results have vindicated our judgment, that following the semi-floating principle it is possible to build an axle which makes accessibility an unnecessary factor in the problem.

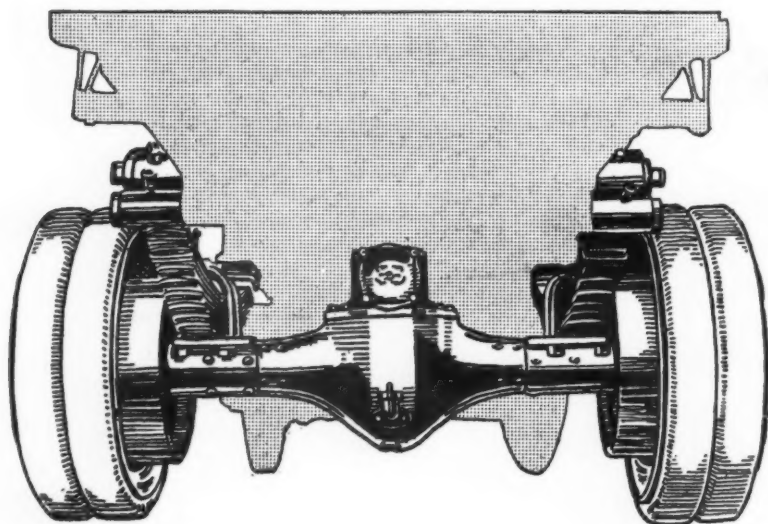
SHELDON BRAKE AND RADIUS ROD EQUIPMENTS are built to provide the most efficient layout for truck makers who prefer the chain drive to other forms. SHELDON BRAKE AND RADIUS ROD EQUIPMENTS are individual in that they provide for the braking energy to be applied at the rear wheels instead of at the jack shaft. It will be seen readily what an improvement this type of equipment is over the conventional jackshaft brake arrangement.



SHELDON TRUCK PARTS are sold only to manufacturers who will agree to use them on trucks with the carrying capacity for which such parts are designed.

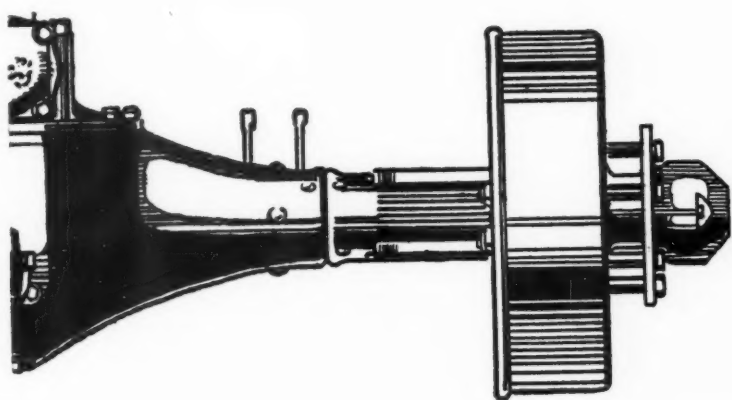
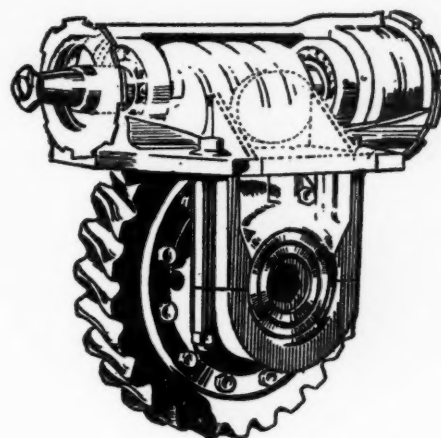
The following clause in our contract and order for automobile axles or other truck parts is a firm foundation upon which the dealer can rely in making statements as to capacity, efficiency and service.

"The buyer agrees to use



DON

AR AXLES



the material called for in this order on trucks with a carrying capacity as given herein. Any departure from this agreement relieves the seller of all responsibility for breakage, and the seller may at his option discontinue furnishing additional equipment for such trucks."

SHELDON WORM GEAR REAR AXLES are made in all sizes for pleasure cars, and commercial vehicles ranging in capacity from 1500 lbs. upwards of five tons.

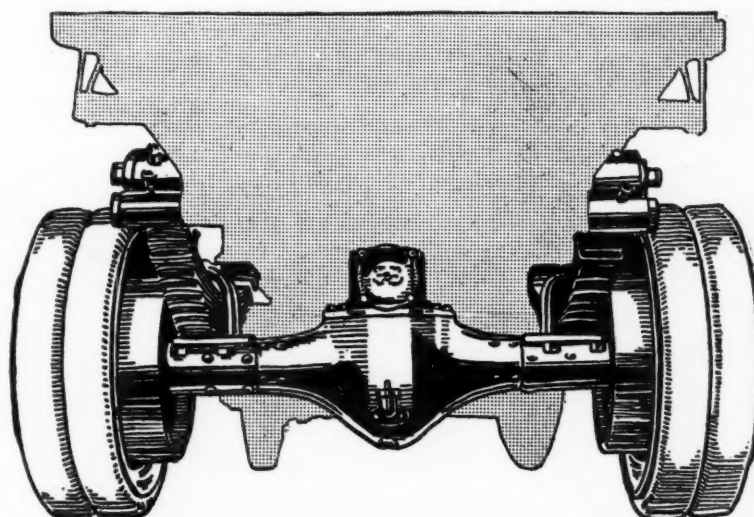
SHELDON FRONT AXLES cover the same range of purposes and capacities.

If **SHELDON** design evidences a preference for certain type of construction, know that no motive other than ultimate efficiency and service governs us.

The selling policy under which **SHELDON** Products are marketed is one of the fairest and most consistent ever conceived. Primarily it is designed to insure the unqualified satisfaction of motor vehicle manufacturers, dealers and users, and since this policy has been rounded out and put into execution it has proven to be the most economical and effective in every way.

SHELDON Products consist of worm gear rear axles, front axles and springs for trucks and pleasure cars, and brake and radius rod equipments for heavy duty trucks.

While **SHELDON WORM GEAR REAR AXLES** represent the highest sum of axle essentials and improvements, and while their efficiency is greater than any other known type or make, and while they are designed primarily for American road and load conditions, their finished appearance, clean lines and balance prove beyond question that American Automobile Manufacturers do not have to import parts or equipment when appearance plays any part in the selection of goods.



SHELDON

SPRINGS

The activities of the Spring Department of the SHELDON AXLE AND SPRING CO. include the design, manufacture, assembly and finishing, complete of front and rear springs, of any type, any size and length required for trucks or pleasure cars, from the lightest runabout to the heaviest truck that ever went on the road.



SHELDON SPRINGS

The rise and growth of the SHELDON AXLE AND SPRING CO.'S spring business has been steady and consistent—in exact proportion to the merits SHELDON SPRINGS possess. In the quarter century just closed the demand for SHELDON SPRINGS has grown from an unimposing beginning to the dominant place in the industry. At the present time the SHELDON SPRING PLANTS cover a total of 14 acres of ground and their combined production is over 3,000 springs daily.

It requires from 60 to 75 tons of steel to furnish the raw material for a day's work of these plants.

Just as the design and manufacture of other SHELDON PRODUCTS are conducted—engineering science, not brute instinct—governs the manufacture of SHELDON SPRINGS.

So practical is this policy that we have been able in every instance to substantiate our claims, that price and service considered, SHELDON SPRINGS are the most economical of any.

The magnitude of our business proves this.

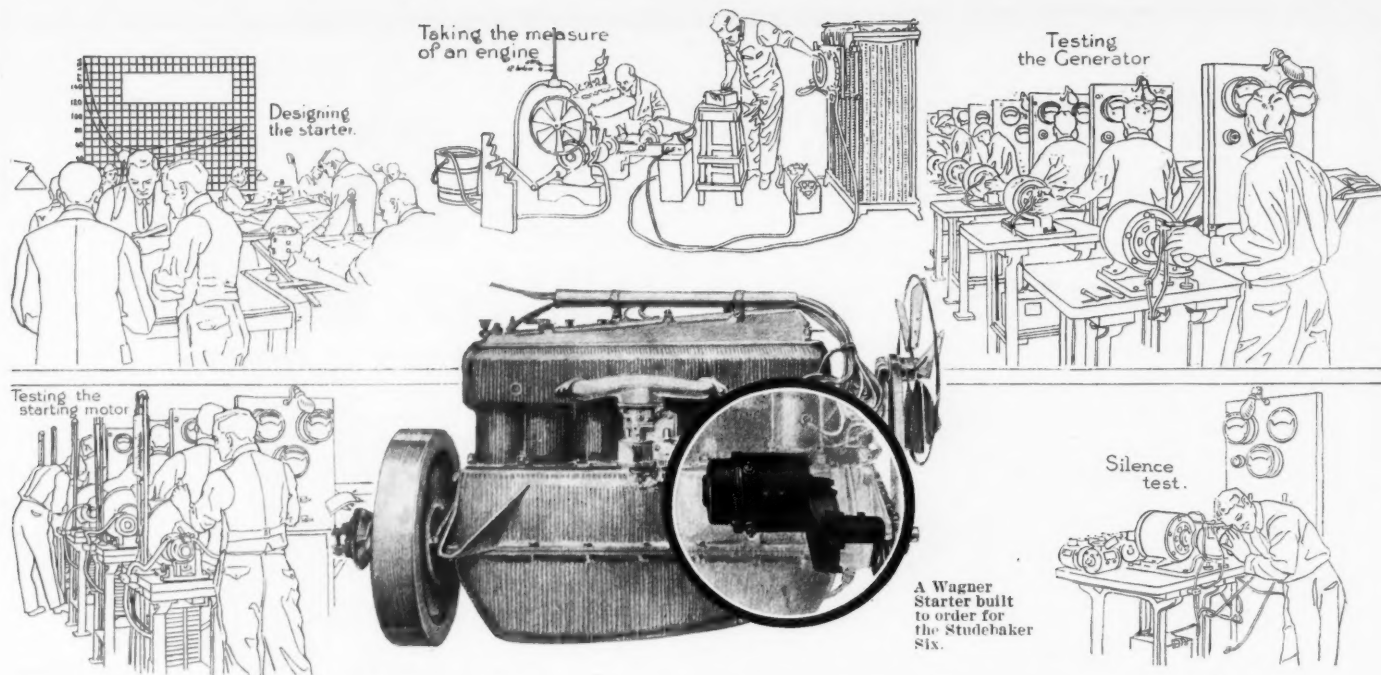
THE SHELDON AXLE and SPRING COMPANY

MAKERS OF SPRINGS AND AXLES FOR HEAVY DUTY SERVICE FOR MORE THAN 50 YEARS
WILKES-BARRE PENNSYLVANIA

Chicago: 122 S. Michigan Blvd.

San Francisco: 444 Market St.

Detroit: 1215 Woodward Ave.



The start of *The* Starter that is built to order.

The Wagner Starter initiates with the car builder's good judgment when he designs his car. It is never an after-thought. It is never built and added to a completed car. The fundamental idea back of the Wagner Starter is that it must be built to order for the car it is to start. The car manufacturer and the Wagner engineers work together.

The engine is designed with proper provision for the location of the starter. An engine is built and turned over to the Wagner engineers, who proceed to measure the engine's cranking requirements under all conditions. From this exact knowledge they design and build a starter that is perfectly suited to that particular type of engine.

The man who buys this car has the same feeling of satisfaction with his starter that he has with his perfectly tailored suit—both are made to order, and both show to the best advantage.

The Wagner Starter

is built by expert engineers who have had 24 years' specialized training in the development of motors, generators, transformers, converters, rectifiers, and electrical instruments of precision. Their skill has made the term Wagner, Quality the sterling mark of the electrical industry, and it has made the Wagner Company

third in size among the great electrical machinery manufacturers of America. Everywhere, from the largest central lighting and power plants, down to the smallest factories, you will find Wagner Motors and other Wagner, Quality apparatus doing efficient work. It must be evident that a Wagner Starter designed and made by such an organization must be right.

The story of the Wagner Starter and the great organization behind it is interestingly told in "The Starter That Is Built to Order." Write for a free copy. If you are interested in motors, either single-phase or poly-phase, generators, transformers, converters, rectifiers or electrical instruments of precision, Wagner, Quality and Wagner Service will have a definite meaning to you. Confer with the nearest Wagner Branch or write



Wagner Electric Manufacturing Co. St. Louis, U.S.A.

**Factory Branches
and Fully Equipped
Service Stations**

Selling Agencies:

Atlanta,

Sioux City,

El Paso

Salt Lake City

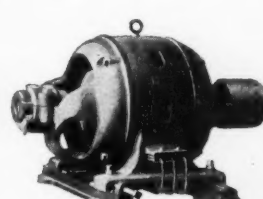
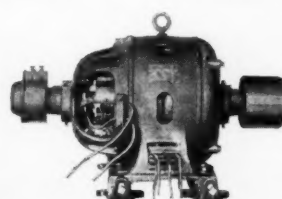
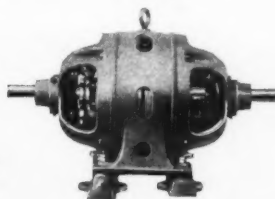
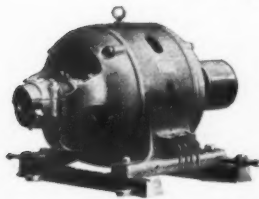
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"Wagner Quality" the Sterling Mark of the Electrical Industry

Please mention *The Automobile* when writing to Advertisers

*The result of
22 years' successful
experience in
building motor cars*



America's Greatest "Light Six" \$1485



THE
HAYNES
America's Greatest "Light Six"

conceded generally as the best car of its type in America today, will be exhibited at the New York and Chicago Automobile Shows.

Three Body Styles

Model 30, America's Greatest "Light Six"—Five-Passenger Touring Car, 121" Wheelbase, Weight 2950 lbs. \$1485

Model 30, The Prettiest Roadster in America..... \$1485

Model 30, The Haynes "All-Weather" Cabriolet..... \$1750

In Addition We Offer Model 33



a brand new seven-passenger touring car. This model is similar to our Model 30, America's Greatest "Light Six," with the exception that it has six inches more wheelbase, a seven-passenger body, 35x4½" tires and weighs 3050 lbs.

This model will likewise be exhibited at the leading automobile shows and the price will be announced January second at the opening of the New York Show. Deliveries February first.

Detailed specifications and full information concerning unoccupied territory upon request.

**THE
HAYNES AUTOMOBILE CO.**

3 S. Main Street
KOKOMO, INDIANA

This coupon
for the
convenience of
intending
automobile
purchasers.

THE
HAYNES
AUTOMOBILE
COMPANY,
3 S. Main Street,
Kokomo, Ind.

Please send me your Catalog
describing America's Greatest
"Light Six."

Name.....

Address.....

I expect to buy a car about.....

Please mention The Automobile when writing to Advertisers

American Axles

To Motor Car Builders:

We make axles to meet the particular requirements of each and every type of high grade motor car.

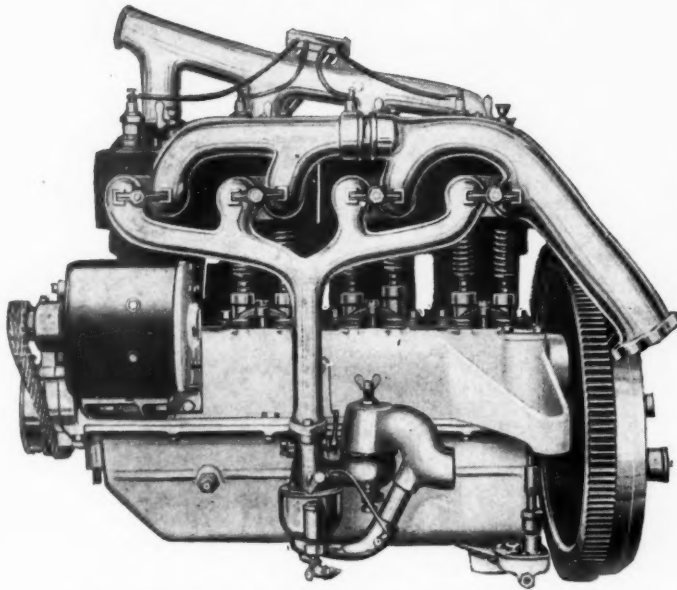
We are the Pioneer Motor Axle Builders of America, and our long experience, places us in position to help materially in solving your axle problems—*and solving them right.*

We solicit your inquiries.

Licensed under The Kardo Company Patents

The American Ball-Bearing Company
Cleveland, Ohio

The Perfect Source of Current



The AUTO-LITE G. C. Generator installed on the new Model 80 Overland.



The AUTO-LITE Model G. C. Generator is designed to be driven by either a chain, train of gears or a belt. It runs at $2\frac{1}{2}$ times engine speed, has a maximum output of 14 amperes and produces current at a car speed of less than seven miles per hour.

WHEN you purchase an automobile upon which the AUTO-LITE system is installed, you secure the utmost a car manufacturer can give in electrical equipment. He has spared no expense to provide you with the most perfect source of current that it is possible to build.

The AUTO-LITE generator keeps your battery charged—all the time. At any speed over seven miles per hour it is storing up current for future consumption. It is absolutely automatic in operation and control.

This simple and positive AUTO-LITE method of governing the current output is of great advantage to car owners. It eliminates all troubles from complicated controls.

The Electric Auto-Lite Company

Home Office and Factory: Toledo, Ohio

New York

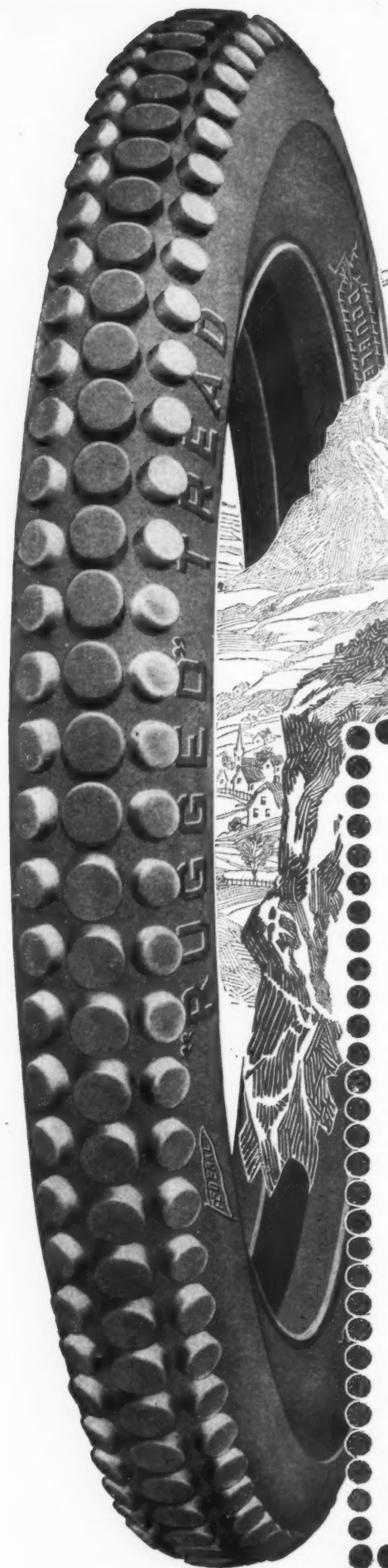
Detroit

Kansas City

San Francisco

Electric Auto-Lite

STARTING - LIGHTING - IGNITION



*As Sure-footed
as the Mountain Goat!*

FOR perfect security in motoring, for assured protection against the dangers of skidding, and for real Extra Service, thousands of motorists pin their faith to

FEDERAL "RUGGED" TREAD TIRES

The Federal "Rugged" is of much heavier, stronger construction than ordinary non-skid treads and no other is heavier. "Rugged" describes it accurately.

These big, sturdy studs of rubber, broad and thick, won't let your car skid. And from the path of the wheel they deflect many an object that would cut or puncture the tire.

Double-Cable-Base

The exclusive Federal Double-Cable-Base construction positively eliminates rim-cutting, side-wall blowouts just above the rim, tube pinching, and the danger of a tire slipping off the rim.

Federal "Rugged" Tread Casings have been materially reduced in price but the Quality remains absolutely unchanged.

Improved methods of manufacture have lowered our production costs on these famous non-skid casings, and we have turned this saving to the benefit of the motoring public.

Begin using Federal Tires now and take advantage of their Extra Service.

FEDERAL RUBBER MFG. CO., Milwaukee
Branches, Distributors and Service Stations in all Principal Cities. Dealers Everywhere.



Living it over Again

In a mental picture, he reviews the accident—the result of his recklessness.

He realizes too late that it is *always foolhardy* to motor on slippery roads and streets without equipping *all four tires* with

Weed Anti-Skid Chains

The Only Real Safeguard Against Skidding

Strange, is it not, that *some men laugh at peril*—they do not seek to avoid danger—and they have no fear because they have no prudence.

They continue to motor over sleety, icy, or wet roads and pavements with "Foolish Dependence Upon Bare Rubber Alone" until a false turn—a sudden meeting at a corner—a slip or a skid—brings disaster as the punishment for their imprudence.

You motorists with reasoning brains put on your Tire Chains at the first

indication of slippery streets, and the editors of the daily newspapers are urging all motorists to follow your example.

For instance, the Public Ledger of Philadelphia, Pa., published by the owners of The Saturday Evening Post, in an editorial on August 1st, 1914, said that the simple adjuration to "*Use Tire Chains on wet and slippery pavements*" deserved to find its way into a law, and that law should by all means be enforced.

Promote "Safety First" in YOUR motoring circle—insist that everyone use Weed Chains on ALL tires.

Weed Chain Tire Grip Co., Bridgeport, Conn.

Manufactured for Canada by

DOMINION CHAIN COMPANY, Limited—Head Office: Shaughnessy Bldg., Montreal, Can.



The Strength and Riding Quality of Your Automobile Springs Depend Upon Their Tempering



A View of Chemical Bath in Our Plant

A Uniform Tempering Heat

The old way of tempering a spring was to put it back into the furnace after it had been quenched in oil, which was at a cherry red heat, and leave it until the oil had burned off. Most quenching oils have a flash point between 120° C. and 180° C., and the burning off of the oil only indicated that this temperature had been reached. If the furnace happened to be hotter at one end than the other, that would make one end of the plate softer. On the whole it was all a matter of guess work.

Another way of tempering a spring is to have a special furnace in which the temperature can be regulated for a black heat. However, these furnaces are large and it is impossible to maintain a uniform heat throughout the entire chamber.

The most satisfactory way is the use of a salt bath, as shown in the photograph. This con-

sists of a cast iron tank which contains a mixture of alkali salts. These salts melt at about 300° C. and can be heated to 650° C. The temperature is uniform throughout and evenly tempers the steel. For this method the plates of the spring are placed in a metal basket and spaced so that they do not touch each other at any point. The basket is then lowered into the molten hot salt for a given length of time, depending upon the temper required, thus producing an even temper throughout every plate.

E. C. Arndts

Metallurgical Engineer

THE CLEVELAND-CANTON SPRING CO.

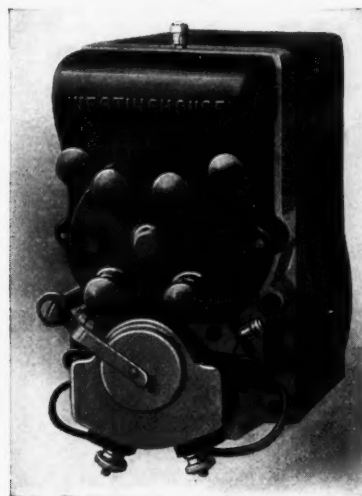
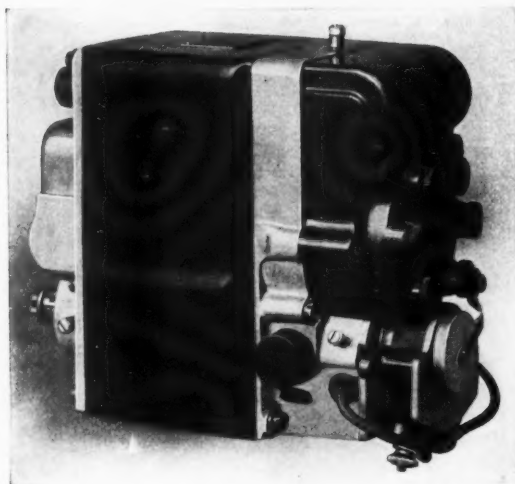
Cleveland-Canton Chrome-Vanadium Automobile Springs are Uniformly Tempered

Best Grade—
"Chrome-Vanadium"

Next Best—
"Special Analysis"



CLEVELAND-CANTON
SPRING COMPANY
CANTON - - OHIO



Westinghouse Ignition and Lighting Generators

38 High Grade Cars now
use Westinghouse Elec-
tric Systems.

26 of these cars are equip-
ped with

Westinghouse Electric Ignition

Here is the list; the stars indicate those with Westinghouse Ignition:

| | | | |
|---------------------|-----------------|-------------------|--------------|
| *Allen | Chadwick | *Lenox | Pierce-Arrow |
| *American La France | *Crawford | *Lexington-Howard | Pilot |
| Amplex | *Davis | Locomobile | Pullman |
| *Atterbury | *Dorris | *McFarlan | Richard |
| *Auburn | FIAT | *Marion | *Seagrave |
| *Austin | Hupmobile | *Moreland | Singer |
| *Briggs-Detroit | *Kissel | Norwalk | *Speedwell |
| *Glide | *Kline | *Ohio | Standard |
| *Haliday | *Lauth-Juergens | *Pathfinder | *Stewart |
| *Case | | | *Vulcan |

Do not fail to see our exhibits

New York: January 2nd to 9th, Grand Central Palace, Spaces 89 to 92 and 97 to 100. Chicago: January 23rd to 30th, Coliseum, Spaces 85 to 88.

Westinghouse Electric & Manufacturing Co.

Automobile Equipment Division

Sales Offices in all
Large American Cities



East Pittsburgh,
Pennsylvania



in your Automobile is no
more important than in your
Typewriting Machine

Therefore the

Underwood

Holder of all international records for



Underwood

"The Machine You Will Eventually Buy"

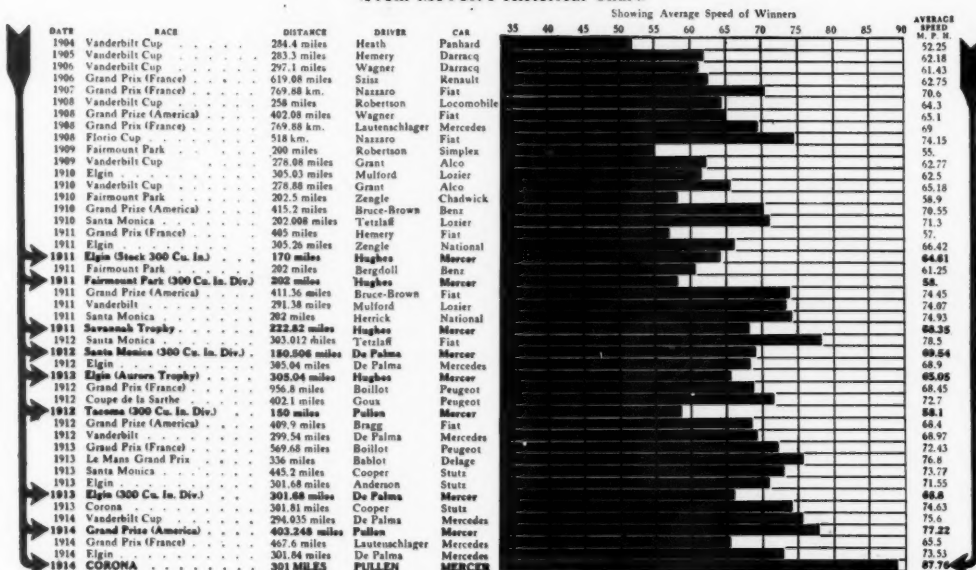
MERCER

THE PRIDE OF AMERICA

Performances speak more than words. Compare the records below, and judge Mercer merit for yourself.

THE WORLD'S GREATEST ROAD RACES

(From MoToR's Historical Chart)

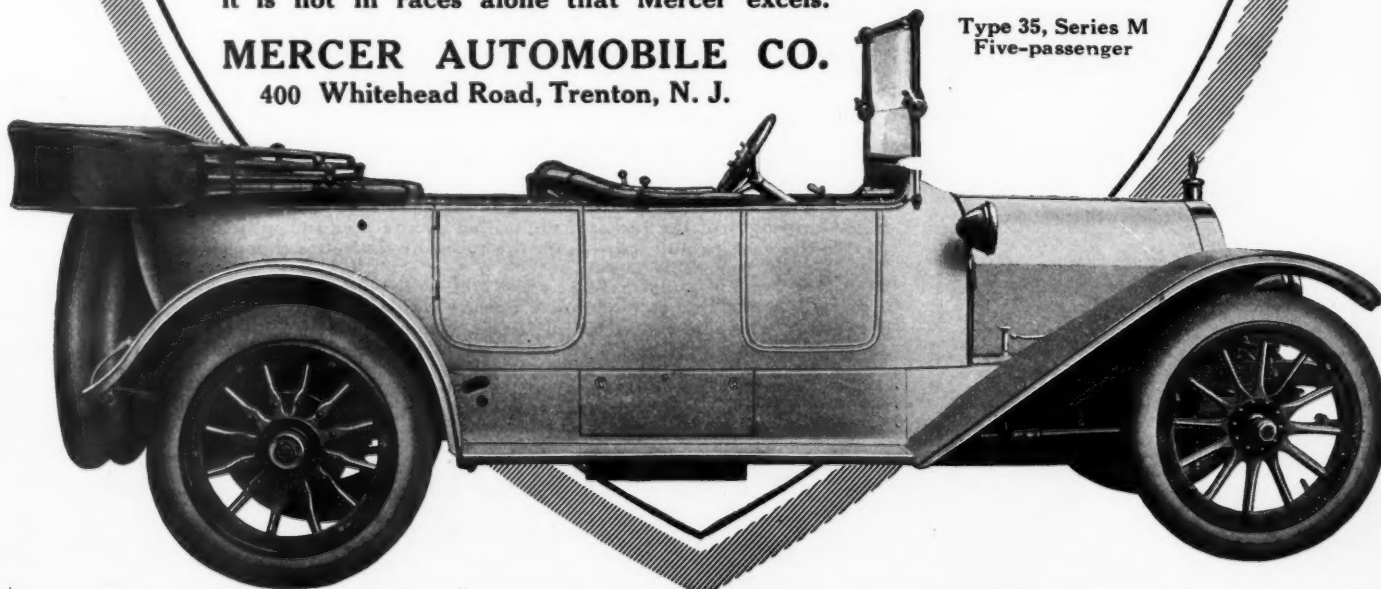


Visit our exhibit at the New York, Chicago, and other Automobile Shows. You will find it is not in races alone that Mercer excels.

MERCER AUTOMOBILE CO.

400 Whitehead Road, Trenton, N. J.

Type 35, Series M
Five-passenger



Please mention The Automobile when writing to Advertisers



Thoroughness

We have at times lost business because of our thoroughness, but subsequent evidence has proven that we are not old fashioned, if a little arbitrary. Here is an instance in point. There is about as much sense to the trunnion method of supporting a radiator as there would be in carrying a baby by the ears. This construction places the burden of resisting all of the strain a radiator can be subjected to upon the thin metal sides of its case. In a short time the weight of the radiator multiplied by the jars and jolts of rough going causes the case to pull loose from the tubes or the tubes themselves give way.

This type of construction is entirely at the mercy of the weaving there always is in the side members of a chassis frame. Good engineers know that a radiator which is supported in saddle made of channel steel and bolted to each side frame member is the only correct method of radiator suspension.

In carrying out our policy of thoroughness we will not build radiators for any manufacturer who uses any other method of attachment.

MAYO RADIATOR CO.

NEW HAVEN, CONN.



Supreme Auto Oil



Light

Medium

Heavy

High Viscosity

Low Cold Test

The Ideal Cold Weather Oil

Burns cleanly—leaving a minimum carbon deposit

Does Not Congeal—Flows Freely at Zero

SUPREME AUTO OIL is especially manufactured to supply the demand for a better cold weather oil. Refined by our special process under the careful supervision of expert chemists, it will conform to the requirements of any lubricating system and economically minimize mechanical friction.

THERE IS MORE POWER IN THAT GOOD GULF GASOLINE

We have an attractive proposition for Dealers and Garages. Write our nearest office

GULF REFINING COMPANY

General Sales Offices: PITTSBURGH, PA., U. S. A.



New York

Tampa

Philadelphia

New Orleans

Boston

Houston

Atlanta



Please mention The Automobile when writing to Advertisers

Go to the Automobile Shows determined to see the

Herff-Brooks Four and Six

YOU dealers who are looking for cars that will sell freely because they are big values, will be well repaid by studying the show exhibits of Herff-Brooks cars.

Run down the specifications point by point, from the powerful motors to the well-built rear axles and the complete equipment.

Notice the number of crank-shaft bearings, the power, the high-grade Stromberg carburetor and best Bosch ignition. Observe the Timken and New Departure bearings, the electric installation, the high-

grade accessories, the complete equipment.

Frankly, such cars would be impossible at the prices if we did not build them complete in one huge factory where, for special reasons, overhead costs are very low. No car in the world is more completely manufactured in one plant than is the Herff-Brooks.

There will be much to see at the shows, but the one thing no dealer should miss is the Herff-Brooks exhibit.

Look at these specifications

Six
\$1375

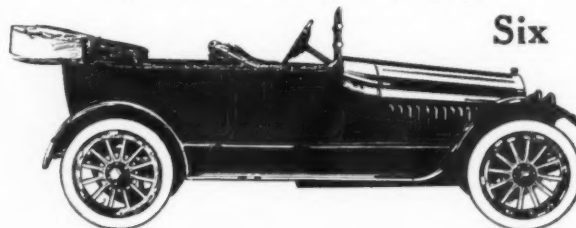
50 Horsepower
Six Cylinders, 4-in. x 4½-in.
Highest Grade Bosch High Tension Magneto DU System
Honeycomb Radiator
Stewart Speedometer
34-in. x 4-in. Goodyear No-Rim-Cut Tires
Stromberg Carburetor
Timken and New Departure Bearings
18-in. Folding Down Steering Wheel
124-in. Wheelbase
Seven Crankshaft Bearings
One Man Top
Turkish Upholstering
Electric Starting and Lighting
Demountable Rims, Extra Rim
Complete Equipment

Four
\$1100

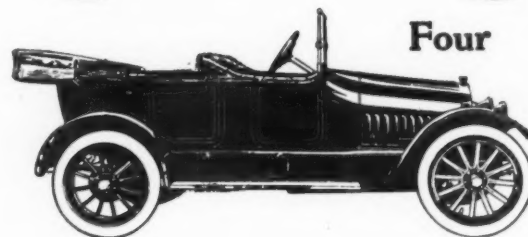
40 Horsepower
Four Cylinders, 4½-in. x 5-in.
Five Crankshaft Bearings
Drop Down Steering Wheel
One Man Top
118-inch Wheelbase
34-in. x 4-in. Goodyear No-Rim-Cut Tires
Electric Lighting and Starting
Stewart Speedometer
Honeycomb Radiator
Demountable Rims, Extra Rim
Timken and New Departure Bearings
Turkish Upholstery
Stromberg Carburetor
Bosch High Tension Magneto DU System
Complete Equipment

*Make our booth your headquarters.
Have your mail sent in our care
both at New York and Chicago.*

Space C-20 Third floor, New York
Space 15 Coliseum Basement, Chicago



Six



Four

Write for Catalogue A. E.

Herff-Brooks Corporation

Indianapolis, Indiana



All argument ends
with your first ride in

The Eight-Cylinder Cadillac

The new Cadillac with its V-type Eight-Cylinder Engine is proving an absorbing topic for engineers and experts as well as for the layman.

Technical arguments, vague and beclouded, can, of course, be advanced for and against any and every type of engine ever produced.

But theoretical speculations in this instance are very short-lived.

There is slight encouragement to argue the pros and cons of a principle when that principle, in the first performance, removes the last, lingering doubt.

That is exactly what occurs in the case of everyone who rides in the Eight-Cylinder Cadillac.

All arguments end with the first ride—whether the observer be an engineer or a layman.

The man who rides in the Cadillac for the first time does not need to be told by a technical expert that its eight-cylinder engine is an impressive success.

He knows without being told.

There is no need to consult blueprints or text books.

He has only to consult his own feelings and sensations.

He recognizes the difference just as clearly as he would recognize the difference, for instance, between riding over the ground and riding in the air.

And compared with previous motor car ex-

periences, riding in the Cadillac is very much like riding in the air.

It is not necessary to point out to him that the Cadillac Eight-Cylinder engine exhibits a new degree of flexibility.

That is perfectly apparent even to an amateur in motoring, in the extraordinary ease of acceleration and the astonishing extent to which the Cadillac travels without gear shifting.

He does not need to be told that the car is surpassingly smooth.

He *feels* it—precisely as he feels that hills seem to flatten out before this wonderful car.

The engineer can explain to the layman the why and the wherefore of these differences; but the layman can feel just as keenly as can the engineer that a ride in this car is not like any ride either of them has ever taken.

It is the business of the scientific mind to withhold judgment until a principle has been proven.

But Cadillac owners have a pleasant habit of expressing complete confidence in Cadillac promises.

They are chiefly concerned to know *how much* and *how far* the Eight-Cylinder Cadillac will surpass all that has been said of it in our announcements.

And they have demonstrated the faith that is in them by placing advance orders to an extent which far surpasses all previous records.

That fine spirit of expectation will not be disappointed.

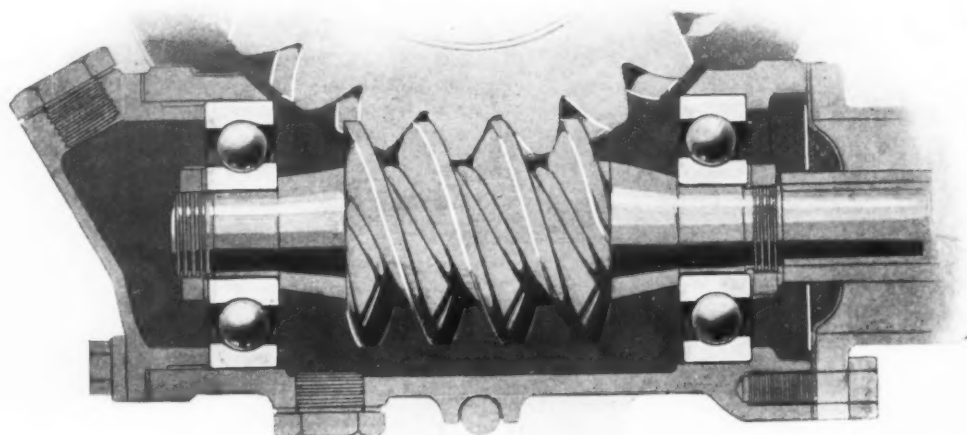
We repeat—for expert and layman, all theorizing will end with the first ride in the Eight-Cylinder Cadillac.

STYLES AND PRICES

Standard Seven passenger car, Five passenger car and Four passenger Salon \$1975. Roadster, \$1975.
Landaulet Coupe, \$2500. Five passenger Sedan, \$2800. Seven passenger
Limousine, \$3450. Prices F. O. B. Detroit

Cadillac Motor Car Co. Detroit, Mich.

Please mention The Automobile when writing to Advertisers



THE RADIO-THRUST BEARING AND THE WORM DRIVE

There are two radical advantages realized by the use of Gurney Radio-Thrust Bearings in worm drive mountings: a great saving in cost, and a distinct increase in efficiency. The startling simplicity of mounting illustrated above, the worm being mounted between two 150% Radio-Thrust bearings, and nothing more, comes with almost a shock to the engineer accustomed to the necessity of an additional costly double-direction thrust bearing with its difficult and expensive mounting. The cost of that big double thrust bearing is saved, and its big housing and the large cost of machining it are likewise eliminated. The above housings are machined straight through with a boring bar at one operation. The worm drive is no longer a refinement available only for high-priced cars. It is brought within the reach of the medium and low priced car.

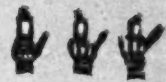
But the gain is not altogether or chiefly in the matter of cost. In efficiency and durability it is actually better than the old, costlier method. The Radio-Thrust bearing is distinguished from the conventional thrust bearing chiefly in its much lower friction. It is peculiarly adapted to carrying heavy thrust loads at high speeds, just the difficult condition encountered in the worm drive. Hence to the difficulties and high cost of mounting the worm drive the GURNEY RADIO-THRUST BEARING comes as a distinct relief.



**GURNEY BALL
BEARING CO.**
JAMESTOWN, N. Y.



Eliminate winter worry



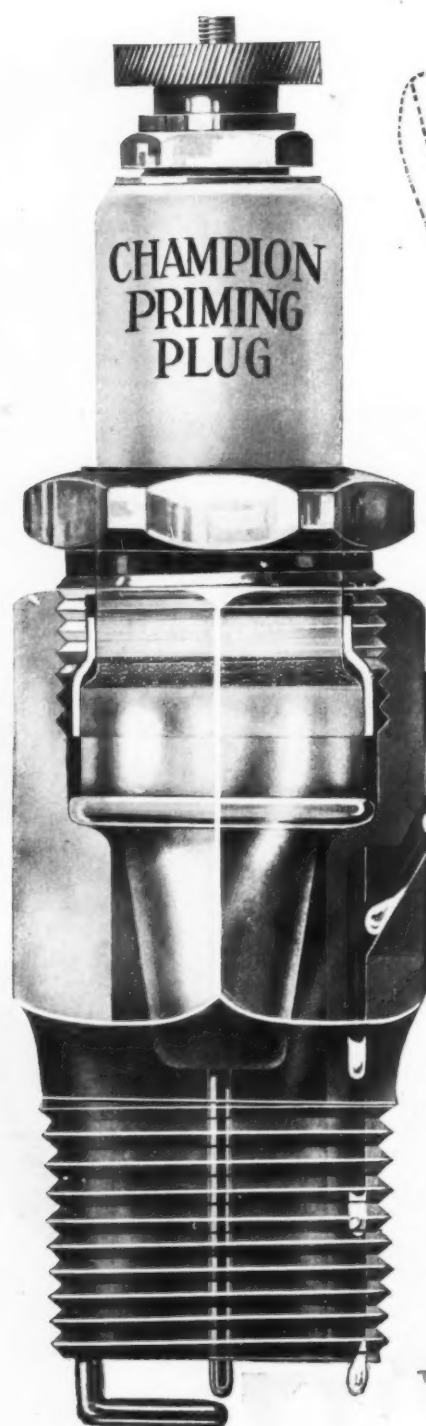
with

"CHAMPION SURE START PRIMING PLUGS"



THE CHAMPION PRIMING PLUG VITALIZES COLD MOTORS

Start Your Motor on the First Quarter Turn



An important new feature on the 1915 Champion Priming Plug. A key lock is supplied with each plug, right on the needle valve—always in place, ready for use.

With this key lock it is the simplest thing in the world to open the needle valve, prime, and then close the valve so tightly that there is absolutely no chance for loss of compression.

Champion Priming Plugs are not an experiment. They are not a freakish idea, placed upon the market one year, and then—never again. Champion Priming Plugs have been on the market for the past four years. They have been a success from the start.

Champion Priming Plugs are built with the same care and manufacturing methods which are used in the manufacture of all Champion Plugs. In fact, the Champion Priming Plug is simply a tried and proven Champion Spark Plug which has the additional feature of a truly efficient priming device.

HOW TO OPERATE. Simply turn the needle valve in the Champion Priming Plug, inject a few drops of gasoline which flows directly to the sparking point. Tighten the valve. Touch the starting button, or give a pull on the crank and "away she goes." You don't even have to remove your gloves, or use a wrench. The key lock on the needle valve makes this unnecessary.

CAUTION. Beware of all Petcock type priming plugs with leaky petcocks.

TOLEDO MADE FOR THE

Open needle valve, turning slightly by hand, and gasoline you inject will flow down through its own channel to plug base. Vaporization occurs directly past igniting points. Explosion will result every time on first turn of starting crank, regardless of cold weather.

Gasoline channel in spark plug shell.

Opening in needle valve for inserting oil can nozzle.

Key lock attached to needle valve to quickly open and close needle valve.

New steel needle valve hardened and ground to a perfect compression-tight seat.

PRIMING CUP PLUG MOTORS



A Few Cold Weather Don'ts

DON'T crank your head off

DON'T exhaust your storage batteries trying to start.

DON'T laboriously remove spark plugs in order to prime your motor.

DON'T depend on petcocks in your motor. Gasoline must be brought direct to the sparking points.

DON'T send for mechanic to start your car.

DON'T be towed home on account of inability to start.

DON'T forget when you are buying a set of priming plugs that you still want ignition. Insist upon the CHAMPION Priming Plug, the only plug made with a needle attachment for priming. Easiest to operate. Needle valve never opens from vibration. Absolutely no possibility of loss of compression.

CHAMPION Priming Plugs are made by the largest manufacturers of spark plugs in the world, the makers of CHAMPION Spark Plugs, which are the factory equipment of over 75 per cent. of all the automobiles made in this country. Here is made every piece that enters into the construction of CHAMPION Spark Plugs—every nut, every center wire, every bushing, every shell, every gasket, every part is carefully wrought from the raw material. Even our porcelain cores are made in our own porcelain factory.

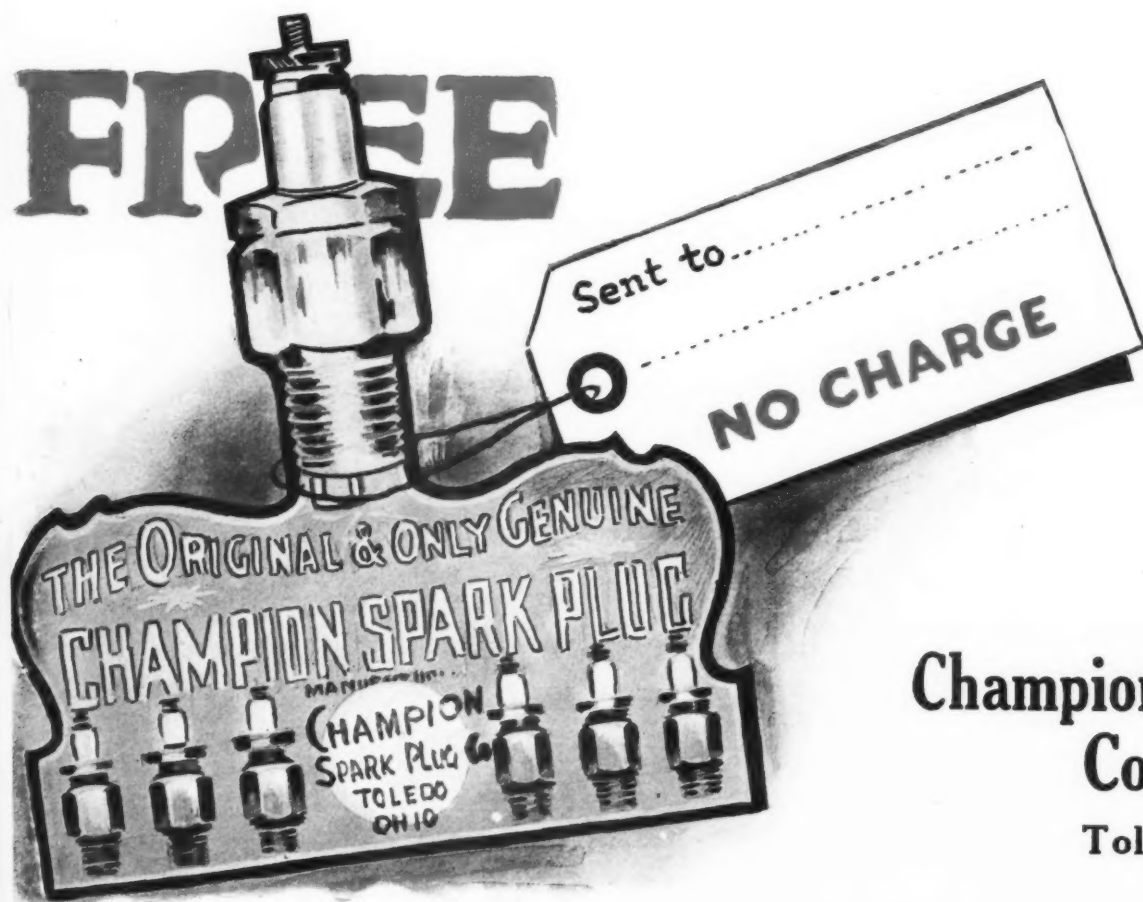
STRONGEST GUARANTEE EVER MADE: Complete satisfaction to the user, or free replacement, repair, or your money back.

Insist upon CHAMPION—the needle valve type of Priming Plug. Made in all sizes to fit any motor.

W H O L E W O R L D ' S T R A D E

A REAL CHRISTMAS GIFT TO THE DEALER

THIS attractive display card, with CHAMPION Plugs attached, we will send free to any dealer ordering through his jobber 100 CHAMPION Plugs in a shipment. You should take advantage of this special offer at once. Order through your jobber and request him to forward the display card direct from our main office, Toledo, Ohio.



**Champion Spark Plug
Company**
Toledo, Ohio

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"

Everlastingly Good

MOTOR NECESSITIES

Here are a few of the new "Everlastingly Good" Motor Necessities to be introduced at the Automobile Shows. Each item produced by us represents the highest mechanical skill in production and has been carefully designed to efficiently fill the place for which it is designed.

This page offers no space even for a small portion of our entire line and few of the details of design, workmanship and finish can be brought out. "Everlastingly Good" motor necessities insure satisfaction to both user and dealer. Send for 1915 catalog and dealers' discount sheet. It represents the most up-to-date and complete line of accessories produced.

Red Head

1915 SPARK PLUGS



REGULAR
1/2 Inch

REGULAR—This Plug is the proven master of any motor up to 40 H. P. Five years on the market; millions in successful use. It has a straight-sided porcelain that "laughs at the heat"—guaranteed not to crack from the heat of the motor.

Highest grade imported Meteor wire sparking points. The cap and center electrode are integral with the porcelain, and the core can be removed without unscrewing plug from the cylinder. All joints are absolutely gas-tight—proof against loss of compression.

They are made in all threads—porcelain or mica. The F. O. R. M. S. plug is specially designed for the engines of the Ford, Overland, Reo, Maxwell and Studebaker. Price \$.75 each



F.O.R.M.S.
1/2 Inch



PRIMING

PRIMING—Has big straight-sided porcelain—guaranteed not to crack from the heat of the motor and almost indestructible; big steel bushing; long body shell—overcomes the depression in the cylinder head and the nut; big priming cup; heavy meteor wire firing points; oil drip bend; lower (pett) coat) end of the porcelain with two insulating surfaces; expansive firing chamber; threaded stem sunk and baked into the porcelain—cannot be twisted or broken off when tightening the terminal. Price \$1.25

BIG BOY—For high duty motors—where there is also an intense spark—where the regular plug is unequal to the strain—use the RED HEAD Big Boy. Has a big indestructible porcelain, a big steel bushing with wide gripping surfaces, a heavy non-burning nickel steel center electrode; three heavy nickel steel firing points, bent to provide a flow for the oil and flattened at the ends to insure a big spark. Carries an unlimited guarantee. Price \$1.00



BIG BOY



The "E. G." Frameline Bumper

This neat bumper is designed especially to equip Cadillac, Overland, Oakland, Winton, Studebaker, Cole, Mitchell, Buick, Hupmobile, Chalmers, National, Jeffery, Peerless and other cars. It is clamped to the top of the frame by an adjustable clip and yoke. Price, finished in nickel.....\$9.00



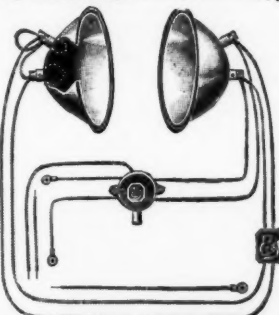
"E. G." Adjustable Channel Bumper

This bumper is designed to fit any car with a channel frame and is attached with forged hook bolts clamping the flanges of the frame. Fitted with stiff steel spiral springs concealed in telescopic tubes, to afford shock absorption. Price, complete.....\$7.85

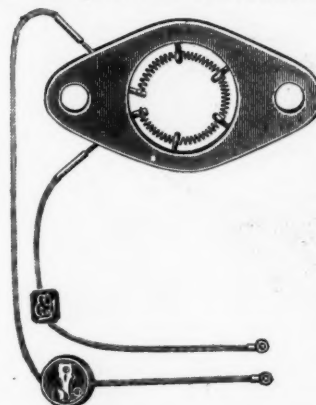


"E. G." Ford Clamp-on Bumper

This is the neatest, lightest and strongest Ford bumper on the market. It clamps on; no drilling. Original design which gives the Ford the appearance of a car with a drop frame. Price, brass finish.....\$6.25



The "E. G." Ford Dual Lighting Outfit Headlights connected to the magneto give illumination only when the car is running. This outfit provides for an additional 2 c. p. 3 V. bulb in each reflector which connect with dry cells and give light when the car is standing. Can also be wired up for electric tail light. Outfit, complete, with 5-pt. switch, \$5.60 to \$6.15, according to size and finish.



The "E. G." Ford Vaporizer

This device heats the charge as it is sucked out of the carburetor causing it to vaporize and rise through the manifold into the cylinders. While simple and inexpensive, it is positive and efficient in its operation and insures a quick start in cold weather. Can be installed in a few minutes by anyone. Furnished complete, with wires cut to length, terminals and switch attached. Price, ready to install.....\$2.00



The "E. G." Lighting Control and Dimming Switch

With this switch you can dim the lights without stopping or leaving the car. It is the only logical solution for overcoming the glare of the headlights. With each switch wiring diagrams are included, giving three different methods of wiring. The case and cover is of hard rubber and metal parts are brass stampings. Price, complete\$1.50 (Special design for Fords.)

Emil Grossman M'f'g Co. Inc.

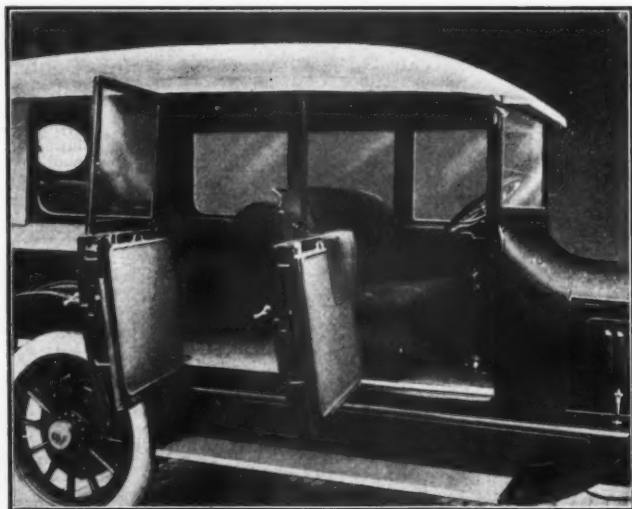
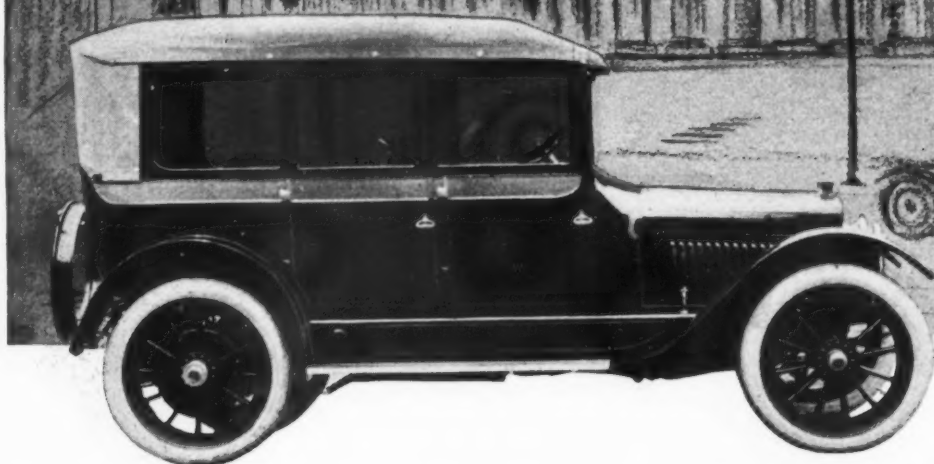
Bush Terminal, Model Factory No. 20, Brooklyn (New York City)

Will Exhibit at the Automobile Show, Grand Central Palace, New York, January 2d to 9th. Spaces D117, 118, 119—Fourth Floor

Please mention The Automobile when writing to Advertisers

SPRINGFIELD

Convertible Bodies



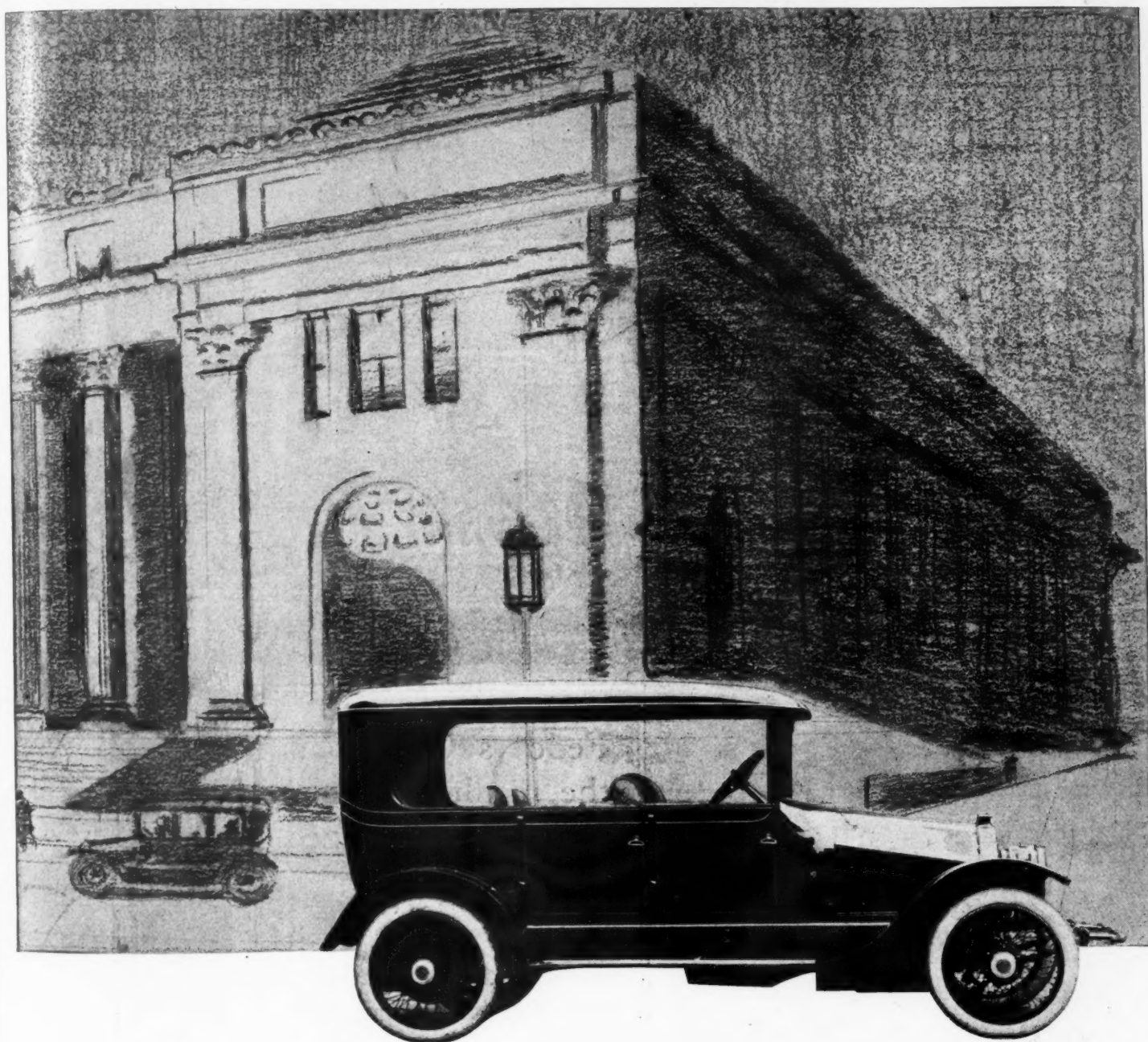
The Springfield Metal Body Exhibit at the New York Automobile Show, January 2nd-9th, is one no dealer can afford to miss.

Your purpose in attending the Show, is one of inspection, comparison and formulation of ideas as to the relative values offered.

Our purpose in exhibiting the various forms of Springfield Convertible and Demi-Convertible Bodies is to convince you of the practical merits of Springfield Bodies and the opportunity they offer you, not only to make money, but to *enable you to sell your customers a car infinitely better adapted to their requirements and pockets as well.*

SPRINGFIELD META

New York Branch: 1737 Broadway



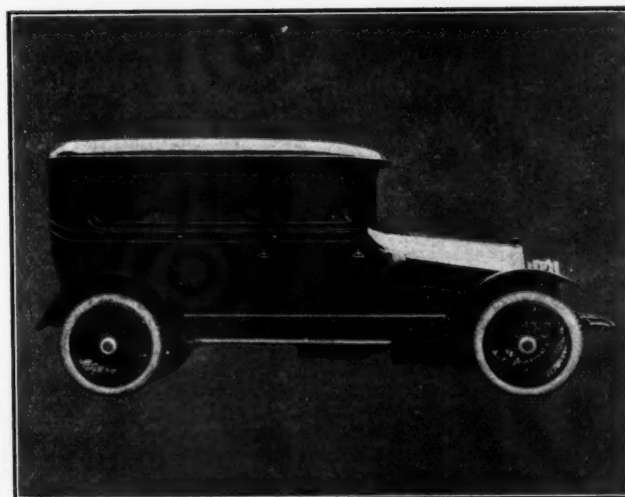
The soundness of the convertible body idea—an all season—all purpose car—made in sizes to fit various standard chassis—should create your desire to acquaint yourself with their intrinsic and merchandising advantages—

The excellence of their design, construction and appointments will establish the reasonableness of their prices—and

The discounts we quote the trade open up a source of added revenue at no extra selling expense.

Talk with several of the leading metropolitan automobile dealers as to the demand that exists for Springfield Bodies and their success in connection with them—and we are content to abide by your decision.

L BODY COMPANY
Springfield, Massachusetts





**FEDDERS
RADIATORS**



ACHIEV

Quantity at no Sa

Fedders Quality is the result of fifteen years of specialized experience.

Fedders design as it stands today is not urged on automobile manufacturers so much as it is recommended as a criterion of style, efficiency and construction to guide them toward perfection in one of the most important details of their cars' equipment.

**FEDDERS
RADIATORS****ELEMENT**
sacrifice to Quality

Fedders facilities, both in shop equipment and in organization, have been developed to such a state of perfection that the automobile industry finds radiator quality reconciled with quantity production—a circumstance which works to the greatest good of the greatest number.

**FEDDERS
MANUFACTURING
COMPANY** Buffalo,
New York

Record
Economy Test
29 Miles on One
Gallon of Gasoline
56.9 Ton Miles
Overland Model 80

FIVE GREAT World Records

The new Stromberg Carburetors have been doing things. They have been making world records in tests which have been officially observed by such men as F. E. Edwards, technical representative of the contest board of the American Automobile Association. Each and every one of the five great records shown in this advertisement is enough to convince you that these new Stromberg Carburetors are the best on the market.

There are records in Gasoline Economy, Power, Acceleration, Flexibility. Each telling and proving conclusively of the wonderful performance of the new Stromberg Carburetors. Read the reports:

Jeffery Six

In an official test this car, which with five passengers, weighed 4100 pounds, equipped with a new Stromberg Carburetor, made the remarkable record of 28.7 miles on 1 gal. of gasoline, or 58.8 ton miles.



Overland 80

Carrying five passengers, total weight 3930 lbs., this car equipped with a new Stromberg Carburetor in an official A. A. A. test, with 1 gallon of gasoline, went 29 miles or 56.9 ton miles.

Speed With Marmon Model 41

The wonderful speed test made on the Marmon Model 41 at Indianapolis was made possible by the fact that the car was Stromberg equipped. During this test the car, with top and wind-shield up, carrying five passengers, made the remarkable record of 62.89 miles in sixty minutes on Gasoline.

Record
Climbing Hill
Test
Haynes Light
Six

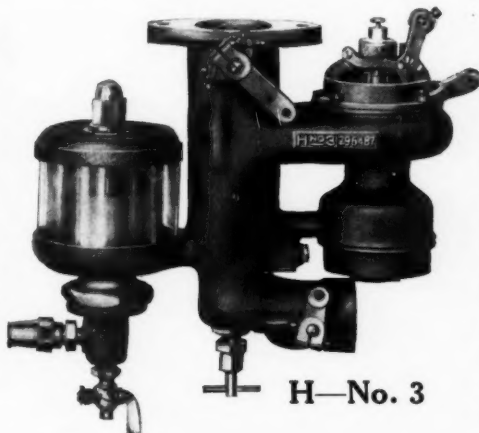
Demand More of Your New Car

You have no idea what a difference the equipping of your car with a new STROMBERG CARBURETOR will make. It will produce a great saving in your gasoline bills, for you will get more and better miles for each gallon you use. This carburetor will insure you a quick get-a-way giving you all the power that any one can desire without sacrificing in the least any of the other requisites of a perfect instrument.

All these tests were made when the temperature was low—in cold weather—under most unfavorable conditions. They indicate what one of the new Stromberg Carburetors will do on your car.

Haynes Light Six

Equipped with a new model Stromberg demonstrated its power in the Pittsburg hill district. It climbed hills on high without overheating. With car and passengers weighing 4390 lbs. running from 2 M. P. H. in high gear it was speeded up to 42 M. P. H. in 200 feet.



H—No. 3

Cole Touring Car

Four cylinder stock car carrying seven passengers, which with the car weighing 4390 lbs. and being equipped with a new Stromberg Carburetor, traveled 24.135 miles on one gallon of gasoline. In thirty minutes speed test this car averaged 55.63 miles per hour.

**See This Wonderful Carburetor at Grand Central Palace
New York, Auto Show January 2nd to 9th, 1915**

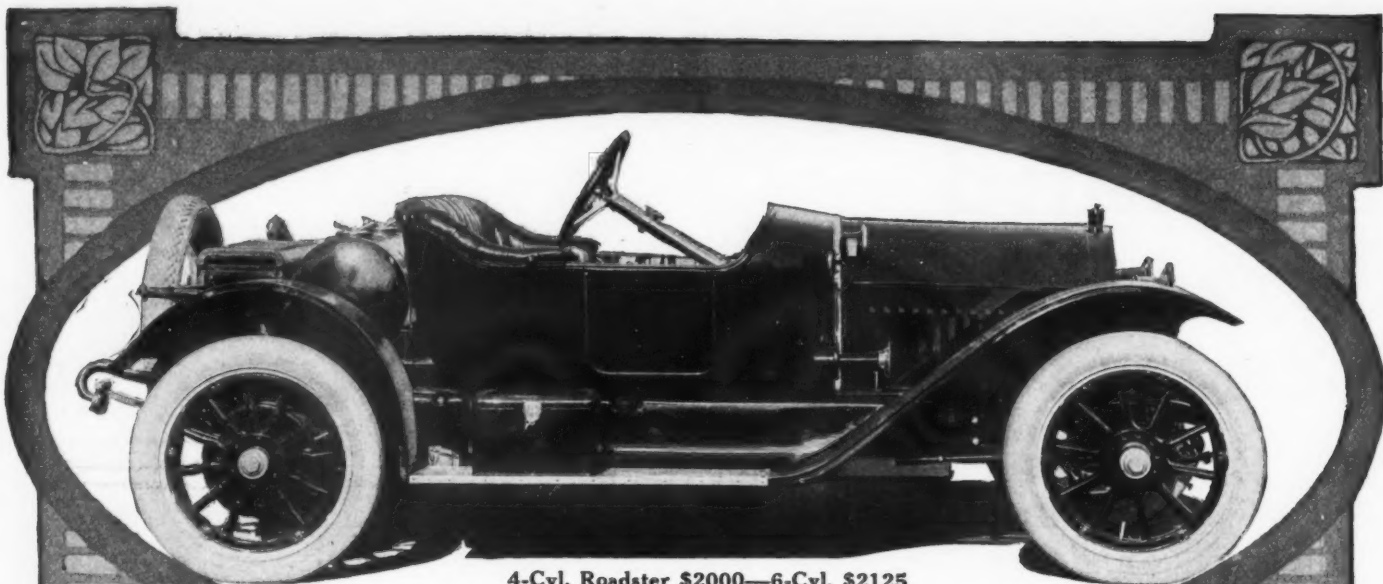
We'll have a full display of the new Stromberg Models at the New York Auto Show—to be held in the Grand Central Palace from January 2nd to 9th, 1915. Drop in and we'll tell you which Model Stromberg will get most out of your car. If you don't come to the Show, send for literature.

Stromberg Motor Devices Co.

64-66-68 East 25th Street
CHICAGO, ILL.

**Record Speed Test
in 62.8 Miles
Constant Running
Marmon Small Six**

**Record Test
Economy
28 1/10 Miles on One
Gallon of Gasoline
58.8 Ton Miles
Jeffery Six**



4-Cyl. Roadster \$2000—6-Cyl. \$2125



Favorite of Every Motorist with the Blood of a True Sportsman in his Veins

A car which for gameness, bull-dog pluck and unfaltering consistency of performance in competition with the picked cars of the world, has won the admiration of the motorists of two Continents.

The Ranking American Car

America's Road Race Champion by virtue of the fact that it has won more road races since their inception than any other American car. Winner of the recent Los Angeles-Phoenix 696-mile desert road race.

See this Record-Breaking Line at the New York Show, January 2 to 9, Grand Central Palace, 2d Floor, Space B 10, and at Chicago Show, January 23 to 30, at Coliseum Annex, Space P 1

The Stutz Complete Line

| 4-CYLINDER MODELS | | 6-CYLINDER MODELS | |
|-------------------|----------------|-------------------|----------------|
| \$1475 H. C. S. | \$2250 Bulldog | \$2125 Bearcat | \$2400 Touring |
| \$2000 Bearcat | \$2275 Touring | \$2125 Roadster | \$3800 Sedan |
| \$2000 Roadster | \$3675 Sedan | WRITE FOR CATALOG | |

DEALERS:—It will pay you to investigate the STUTZ line before closing contracts

Stutz Motor Car Co., Indianapolis, Ind.

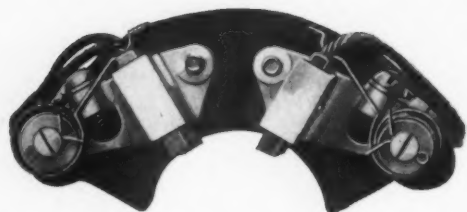
Agencies in All Principal Cities

Dyneto
TRADE MARK
REGISTERED

**SINGLE
UNIT
ELECTRIC
STARTING &
LIGHTING
SYSTEM**



BESIDES being positively dependable and durable, renders motor absolutely proof against stalling. More powerful as motor, more efficient as generator than two unit systems—yet weighs less than combined two units.



**Brush
Holder
Assembly**

Granting that you fully appreciate the value of a single unit electric starting and lighting system that always can be depended upon to furnish ample power for both starting and lighting—that positively and automatically prevents you from ever stalling your motor—that is small and compact, so much so that it weighs only 45 pounds—

Granting that you are cognizant of the advantage of having such a personification of efficiency and dependability as a part of your motor car, think now of this further all-important feature.

**This is
the plus
value**

The Dyneto single unit electric starting and lighting system will more than likely outlast any car upon which it is installed.

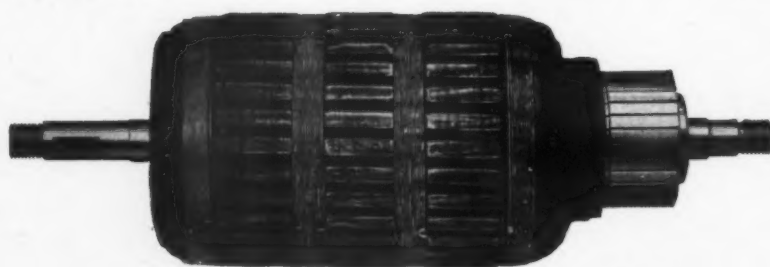
Because of the unique design which provides for the elimination of all complications and wearing parts such as cut-outs, relays, solenoids, clutches, gears, etc.—because of the use of only the very finest and most expensive materials in its construction—because of the utmost care in the machining and manufacturing of each and every part that goes to make up the finished unit—because of the insistence of this care in manufacture by most exhaustive tests and inspection of each and every operation, singly and in assembly—

The Dyneto single unit electric starting and lighting system will stand up and perform to its fullest efficiency long after most other parts of the car upon which it is installed have required repair or replacement. About the only parts of the Dyneto that will show any wear at all are

**Almost
nothing
to wear**

the brushes and we have made any number of tests which indicate that those brushes will stand up for as much as 100,000 miles.

**Armature
Assembly**



Just as prima facie evidence of the truth of these past statements, herewith are a few details.

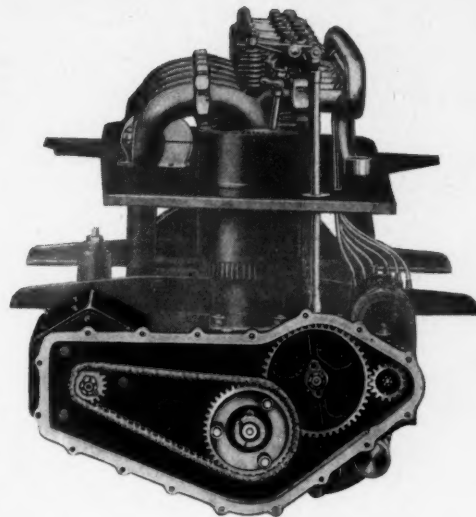
**Quality
Always
Present**

Wherever it is possible to use stampings instead of cheaper castings, stampings are to be found in the Dyneto. The shaft is made of the finest and most expensive alloy steel specially heat treated, when a cheaper and inferior substitute might easily be used without detection till months after the system had been sold. The commutator segments not only are of special design to prevent wear, but they are made under a special process to insure hardness. In addition to this the copper used is the purest and highest grade obtainable. Dyneto brushes not only cost more as bought by us in bulk, but each brush is carefully examined and tested before it is assembled. And to insure full efficiency out of this exceptionally high value material the tools and dies with which these materials are machined are specially designed and specially produced.

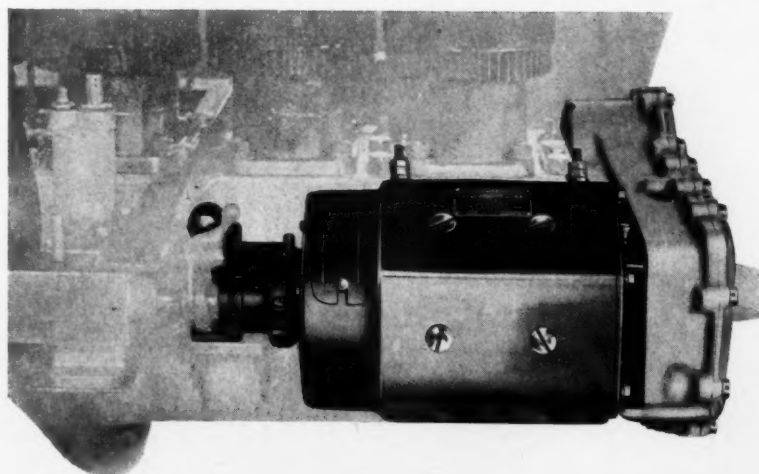
**Basic
Design
Unique**

And with this supremacy of design, materials, and construction which assures maximum efficiency, maximum dependability, maximum durability, the Dyneto is comparatively lower in price than most other starting and lighting systems on the market.

This condition is the result of our design purely. The trouble breeding complications of all other systems not only emphasize the superiority of the Dyneto but by their costliness they place the cost of the other systems comparatively above the cost of the Dyneto.



**Franklin
Application
—End View**



**Franklin
Application
—Side View**



THE COLD WEATHER TEST

Following are the results of a recent test made with the Dyneto coupled to a four-cylinder motor $3\frac{3}{4} \times 5\frac{1}{2}$ with approximately 75 pounds compression.

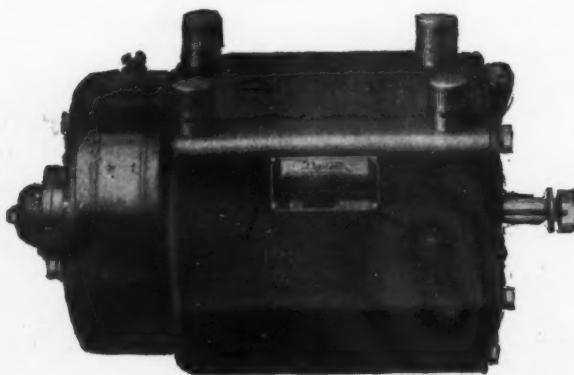
The motor was placed over night in a cold storage plant and the tests were made at varying temperatures from $7\frac{1}{2}^{\circ}$ below zero to 28° above zero. Perfect starts ad lib. resulted without a single failure during a long period of time—until the witnesses were tired of watching.

Then after purposely discharging the battery completely and allowing only 40 seconds for recuperation, the Dyneto gave 22 consecutive starts at 10 seconds intervals.

This simply emphasizes further our claims of supremacy in general and the specific facts that as a motor the Dyneto is naturally more powerful than the smaller motor in a two unit system; while as a generator the Dyneto is far more efficient than the smaller generator of a two unit system; and yet its weight is much less than the combined two units.

DYNETO ELECTRIC CO., Syracuse, N. Y.

Send us any electric problems you may have.





THE NEW NATIONAL RADIATOR upsets all precedents in radiator construction. Study the illustration for a moment and you will see why the NATIONAL RADIATOR gives greater strength, bigger cooling surface and uses less water than any other.

An Entirely New Principle of Construction

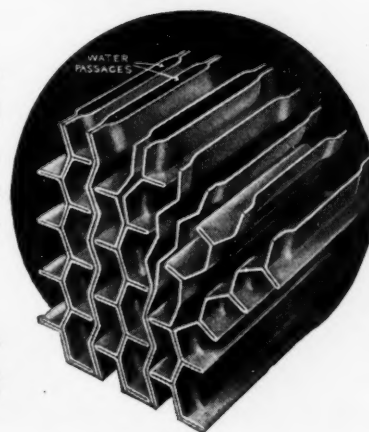
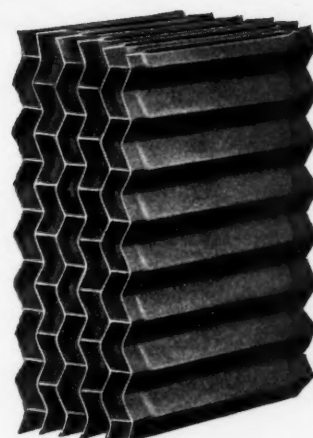
Made of continuous bands of brass, not built up cell by cell but made as a unit. Radiator leakage is not caused by rust, neither do the tubes burst from over-pressure. The continuous racking strains and jars of the road are alone responsible and surely in time cause the ordinary tubes to pull apart.

The special corrugated construction of the NATIONAL RADIATOR is a natural shock absorber, making the Radiator practically everlasting.

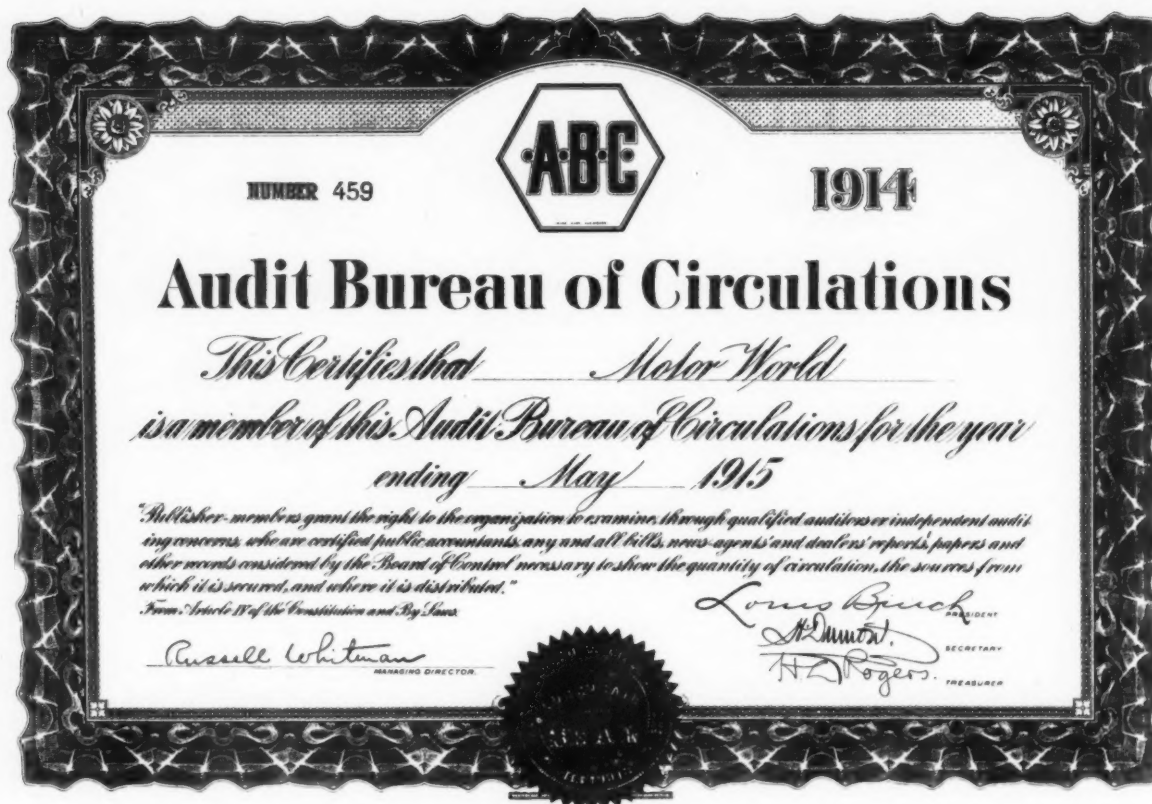
Both air and water tubes are exceptionally large, thus insuring free circulation and greatly increased cooling capacity.

All NATIONAL RADIATORS are tested at not less than fifteen pounds air pressure under water.

THE NATIONAL CAN COMPANY
Detroit, Michigan



STOP — LOOK — LISTEN



The above reproduced certificate of membership in the Audit Bureau of Circulations is an insurance policy for Motor World advertisers. It is an invitation to you, Mr. Advertiser, to come to our offices **any time, without giving advance notice** and investigate our subscription records. The result will be to impress you with not only the quantity but the quality of Motor World's national dealer circulation.

MOTOR WORLD

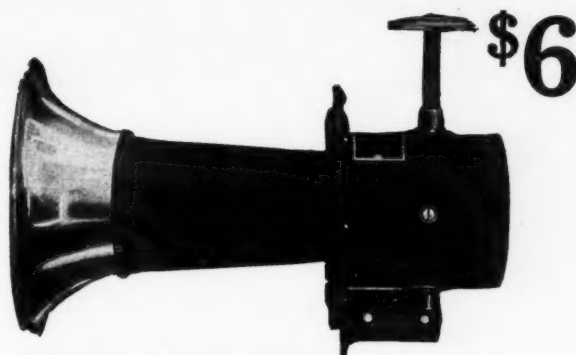
239 West 39th Street, New York

Please mention The Automobile when writing to Advertisers

The Horn That Speaks For Itself

THE *Handphone* hand-operated horn has established an enviable reputation for efficiency, durability and power. It is mechanically perfect, easy to operate—the slightest touch of the lever gives an instantaneous loud, deep, penetrating warning.

Convince yourself of the merits of any horn before you buy—compare the *Handphone* with any other mechanical horn and the difference will be instantly apparent.



The Handphone

Guaranteed for
Three Years

*All We Ask Is A Fair
Comparison of Values*



Handphone Type C

Has the same mechanical construction as the larger horn.

\$8



Newtone Superior

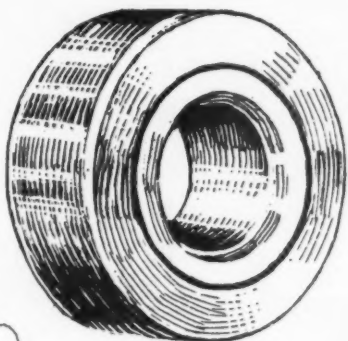
*The Best Motor-Driven
Horn At Any Price*

We believe The *Newtone Superior* to be the most perfect motor-driven horn on the market. It has a wonderful volume of sound with a minimum current consumption, an average battery lasting six months.

Compare it with other horns of similar type and size, selling at anywhere within double the price and judge for yourself.

Write or telegraph at our expense For The Best Dealers' Proposition Made

AUTOMOBILE SUPPLY MFG. COMPANY
220 TAAFFE PLACE See Us At The Shows BROOKLYN, N. Y.



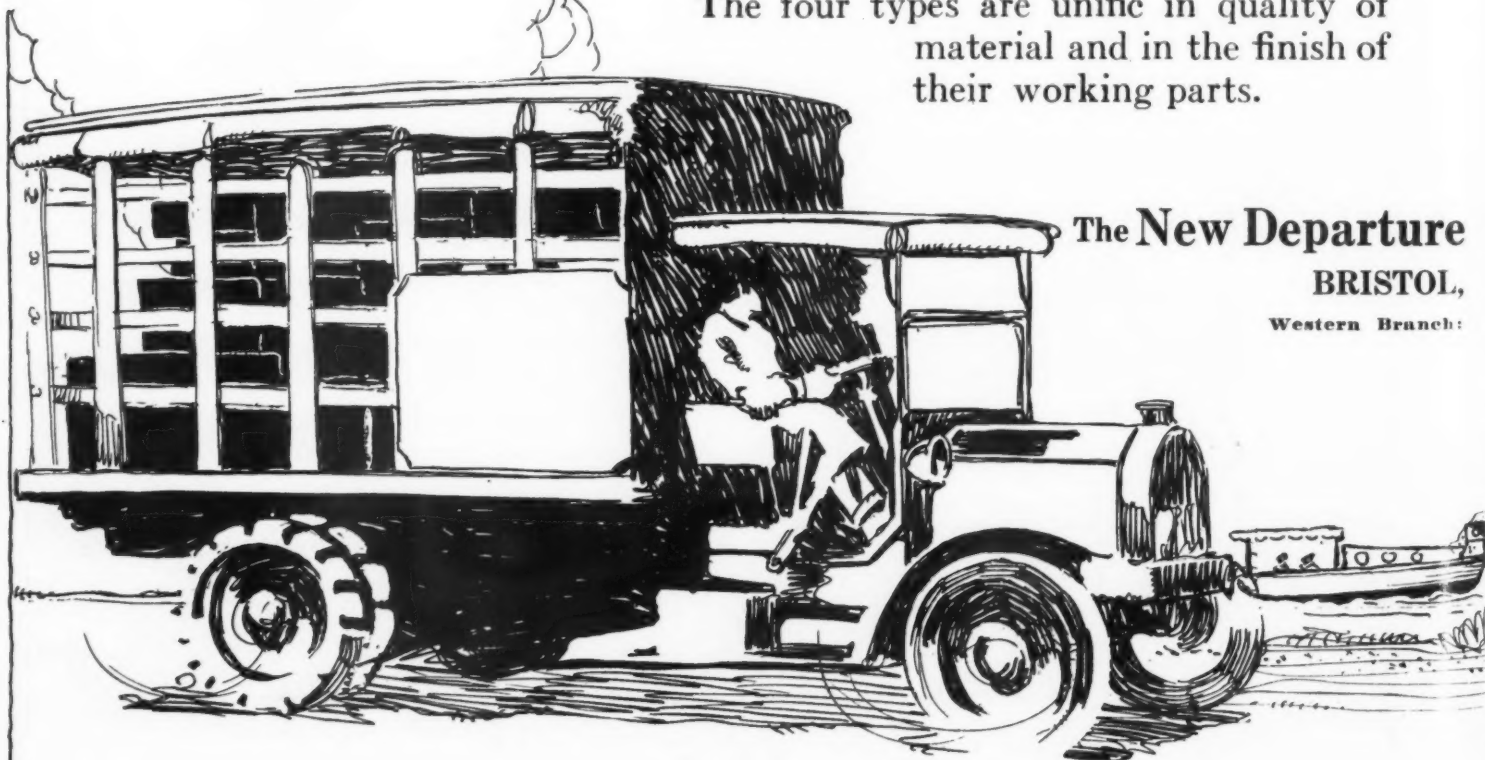
NEW DEPARTURE

The Elimination of Friction for Bearings in Motor Driven Craft

NEW DEPARTURE Ball Bearings are the product of a New England manufactory which for a quarter of a century has enjoyed a world wide reputation for the quality of its product, the up-to-dateness of its equipment and manufacturing methods, and the soundness of its standards and policies.

There are four types of New Departure Ball Bearings—The Double Row, a combined radial and thrust bearing; The Single Row, strictly radial; Radax, a perfected cup and cone bearing, taking radial loads and thrust from one direction; The Magneto, used in magnetos and other devices where high speeds develop.

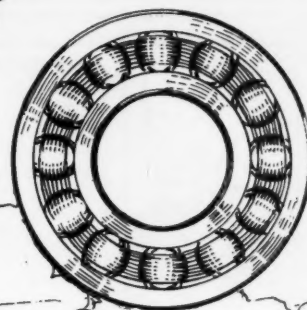
The four types are unific in quality of material and in the finish of their working parts.



The New Departure
BRISTOL,
Western Branch:

BALL BEARINGS

lowers the use of these Quality
on Land and Sea or in the Air



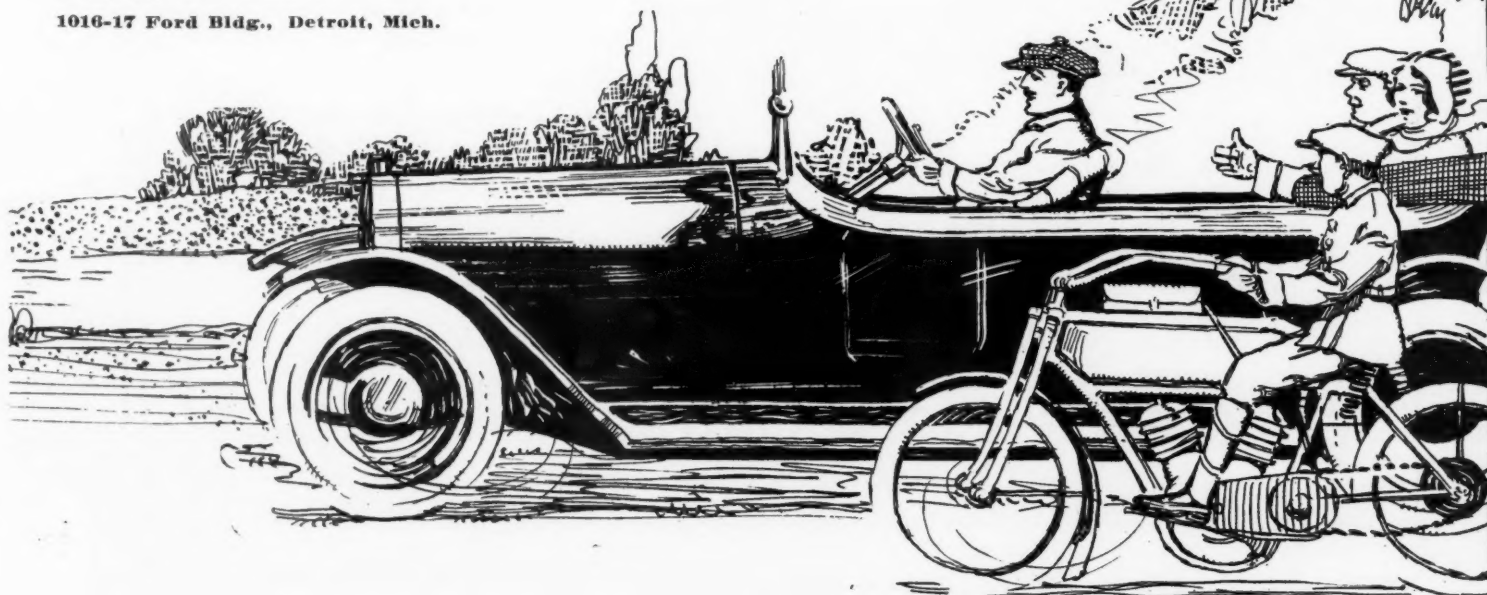
Our present capacity is more than 20,000 bearings per day.

Each type is stocked in quantity and made in such variety of size that there is available a New Departure for every purpose—a size for every need.

Manufacturing Company

CONN., U. S. A.

1016-17 Ford Bldg., Detroit, Mich.





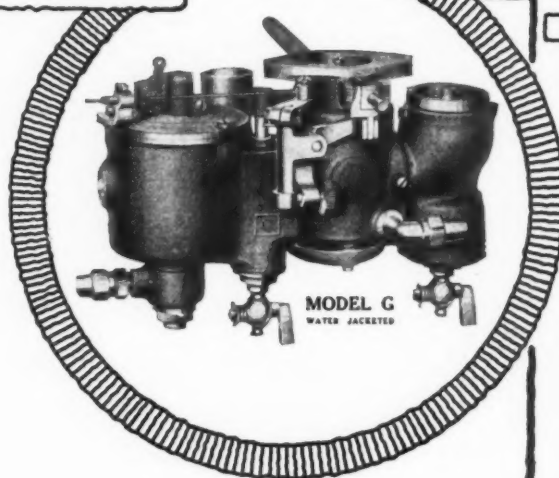
RAYFIELD

CARBURETORS



Getting the best in carburetors

WHEN an automobile maker adopts the Rayfield carburetor as standard equipment, he does so simply because he wants the best, and is willing to pay for it.



And generally, you will notice, Rayfield equipment is advertised by the cars that use it, because most people know that the Rayfield is the best carburetor on the market and naturally have confidence in the car manufacturer who uses it.

After all, compared to the selling advantage given a car equipped with a Rayfield and the much increased efficiency of the motor, what does the

slight extra cost of the Rayfield amount to? The owner of a car with Rayfield equipment will save in gasoline alone in the first two months' driving more than enough to make up its slightly greater initial cost to the manufacturer.

For every type of car, from the smallest to the largest, the Rayfield is absolutely guaranteed to save 10% to 50% in fuel and on all other points to exceed the performance of any other carburetor.

No matter what car you drive, you ought to have a Rayfield on it.

FINDEISEN & KROPF MANUFACTURING CO.

2117 Rockwell Street, Chicago, Illinois

Branches: 1140 Michigan Ave., Chicago 1211 Woodward Ave., Detroit 1902 Broadway, New York



Hannold
Undertaker
Philadelphia



Hotel Benson
Portland, Ore.



Hudner Markets
Provisions
Fall River, Mass.



E. Welch
Florist
Hartford, Conn.



U. S. Mail
Washington, D. C.



Wagner Pastry Company
Newark, N. J.



Bell Telephone Company
Buffalo, N. Y.



Bonwit-Teller
Millinery and Ladies' Wear
New York

Stewart

Stewart Owners Buy More Stewarts

—because Stewart trucks, by paying for themselves in a year, are a good business investment.

—because Stewart trucks stand up under the hardest usage.

—because Stewart trucks mean big profits by making money for owners, saving time and bringing trade.

—because Stewart trucks are designed right; constructed right, and built of finest materials.

—because Stewart trucks are simple in design and simple to drive.

—because comparisons show that Stewart trucks cost less to operate than any other delivery trucks made.

—because Stewart trucks show an average annual repair expense of only \$1.37 per truck.

—because Stewart trucks do the work for which larger trucks were formerly thought necessary.

These are reasons why Stewart owners never go back to other makes of delivery trucks.

These are reasons why among Stewart owners—and they are to be found in 120 cities and 85 lines of business—there is today *not a single dissatisfied user.*

And these are reasons why Stewart owners buy more and more Stewart trucks all the time.

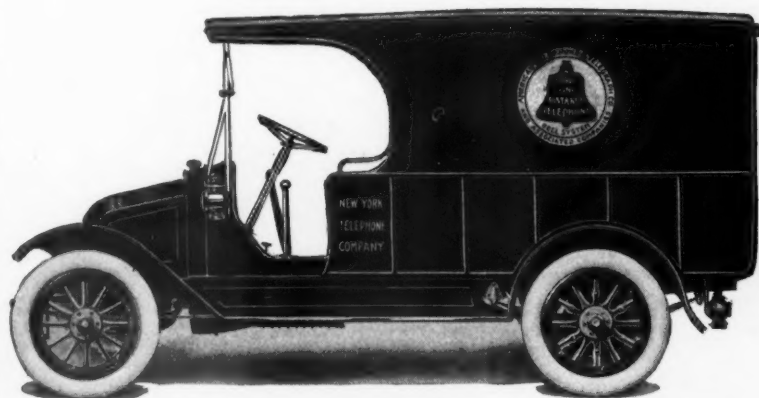
Not only do owners endorse Stewart trucks by first choice and by reorders. Engineers—mechanical experts of high repute—tell us that Stewart trucks are *right*. Not one of them has

ever pointed to any feature of the Stewart that needs to be improved.

That Stewart trucks make good and win the confidence of owners everywhere is only natural. For Stewart trucks are built by specialists. All our facilities, all our energy, and the experience of an expert organization have been *concentrated* for five years on this type of delivery truck.

Write *today* for our book, "How Motor Delivery Pays." It contains much information of interest to every business man and every business house with goods to deliver.

Stewart Motor Corporation, Buffalo, N. Y.



Dealers: Ask About Our New Policy

We have a dealership proposition that is unusually liberal. We can assure more prompt deliveries, by reason of increased facilities and larger output. And we do not require dealers to put up a lot of deposit money, nor to contract for a big number of trucks.

Write *today* and learn about the Stewart proposition—and why it will be to your advantage to handle the Stewart; providing, of course, your territory is now open.

Paterson

Four Cylinder, Long stroke
Motor, Delco Starting
and Lighting System,
\$1095



Model 4-32

To the Man Who Sells Motor Cars

The PATERSON line of motor cars is the line with the VALUE, STYLE and FINISH, made in Flint, Mich., by W. A. Paterson Company, one of the strongest organizations in the business, who have had forty years' experience in the manufacturing industry.

The PATERSON car for 1915 represents the total and combined knowledge of the best and most carefully trained engineers in the automobile industry. This statement is proven by the fact that PATERSON QUALITY reflects the combined buying powers that compose the acknowledged leaders of the automobile world.

Our Four and Six cylinder cars are fitted with NORTHWAY long stroke motors, Weston-Mott full floating demountable rear axles, Delco Single Unit Starting and Lighting system, Stromberg carburetors, One-Man Top, and other

high grade units installed and applied the PATERSON way.

We are soliciting the business of distributors in the different automobile centers, who have an established trade, and a line of agents that can and will push a standardized line of automobiles that have the VALUE, STYLE and FINISH.

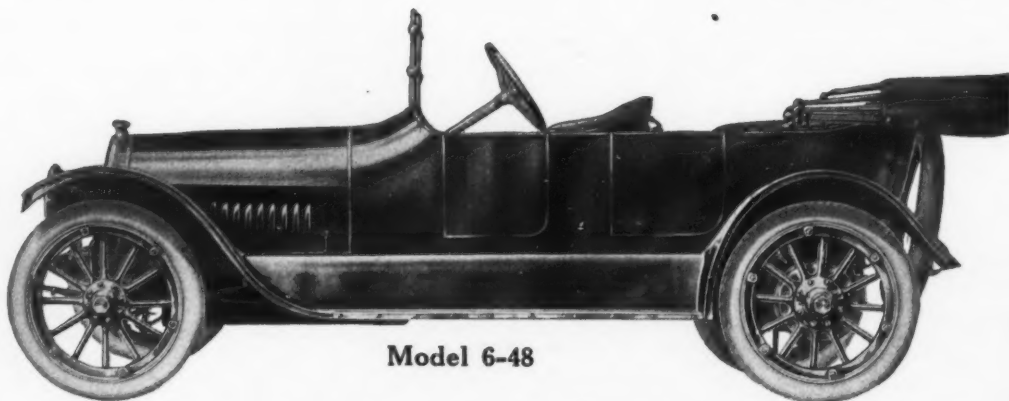
Our distributors' proposition is an attractive one, and our local agency contract deal will interest any high class dealer that desires to handle a line that will help him in building up a trade that will increase from year to year and stay with him.

W. A. PATERSON COMPANY

FLINT

MICHIGAN

Six Cylinder,
Long stroke
Motor, Delco
Lighting and
Starting
System,
\$1495



Model 6-48

Please mention The Automobile when writing to Advertisers



Lexington

We Say This to You

The owner of a **Lexington Thoroughbred SIX** has made an investment in automobile quality—style—service and comfort that justifies him in saying to his friends:

"Pay the price—buy a real car—buy this one. It is the best piece of automobile construction in America for the money."

\$1875 f.o.b. factory, and worth more

The Lexington-Howard Co.
Columbia Ave. North, Connersville, Ind., U. S. A.

See us at New York Show at Space C-19—3rd Floor, Grand Central Palace. Chicago, at Space E-5 and 6, Armory.



The most remarkable

We Also Say This To You

This automobile has been built for men who want better quality—better design—better engineering and better workmanship than is obtainable in the ordinary six-cylinder car.

This is an extraordinary car and we will prove it to the man who knows good automobiles and buys only that kind.

Price \$1875 f. o. b. factory, and worth more

The Lexington-Howard Co.
Columbia Ave. North, Connersville, Ind., U. S. A.



e "Six" ever built!

And This Will Interest You

The Lexington Thoroughbred Six is a perfect, silent, smooth-running car at all speeds and at all times.

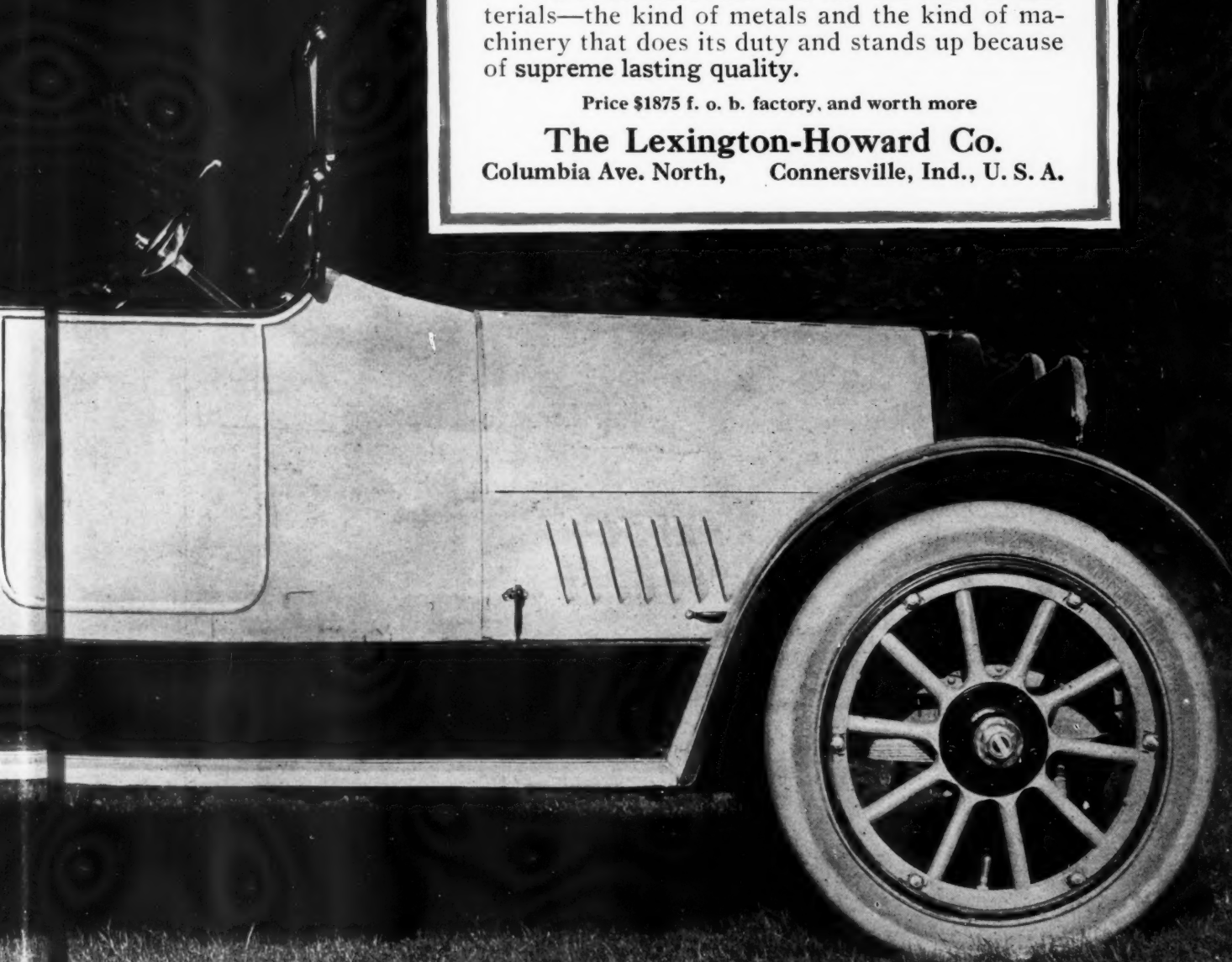
When it is new—after six months—on its first birthday, and long afterwards.

We have built into this car the kind of materials—the kind of metals and the kind of machinery that does its duty and stands up because of supreme lasting quality.

Price \$1875 f. o. b. factory, and worth more

The Lexington-Howard Co.

Columbia Ave. North, Connersville, Ind., U. S. A.





We Say This to Dealers

To men who can sell good cars
and who want to sell a car that
stays sold—

The Lexington Thoroughbred
Six is an automobile that you can
sell to that group of men in your
city who are not going to argue
about two or three hundred
dollars if you can show them **the
real thing** in a car.

This is the car—write for com-
plete details.

\$1875 f. o. b. factory, and worth more

The Lexington-Howard Co.
Columbia Ave. North,
Connersville, Ind., U. S. A.

MAKE WINTER DRIVING A PLEASURE

Ieco STEER WARMS

Don't Suffer from Cold

STEER WARMS make winter driving safe. Protect the driver from catching cold. Save cost on winter gloves. Are indispensable to motor truck drivers.

STEER WARMS are electrically heated, leather covered grips that lace on the steering wheel. These neat devices are heated by current from either storage battery, dry cell or magneto. On Ford cars they are connected to the magneto.

STEER WARMS take only half the current of electric headlights and will not damage your storage battery. They deliver the heat to the fingers where it does the most good, keeping the hands and body warm on the coldest, rawest day.

STEER WARMS are easily attached. Will fit any car. No bolts or screws—no holes to bore. Lace on—wire up—that's all. They are guaranteed to give satisfaction—money back if they do not.

Price Steer warms for any car, \$7.50 per pair complete; Special Steer Warms for Ford Cars, \$5.00.

Sent postpaid complete, ready to attach, upon receipt of price, or C. O. D. if desired.

Dealers These are quick sellers. Every owner wants a set. Guaranteed. We stand back of you. Get your share of the business. Write for discounts.

**EASILY
ATTACHED
—
INEXPENSIVE
—
GUARANTEED**

Eliminate Your Starting Troubles with IECO MANIFOLD PLUG

THE IECO MANIFOLD PLUG due to its ELECTRICALLY HEATED COIL, is guaranteed to start your car on the coldest winter day as easily as you can start on the hottest day in summer.

Tests your carburetor at any time regarding quality of mixture.

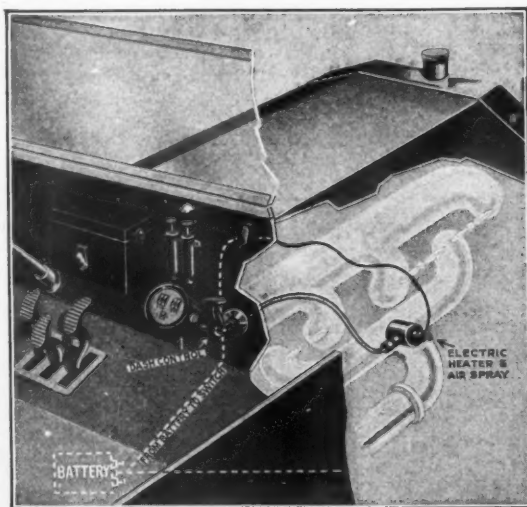
Keeps your cylinders free of carbon by using a little kerosene through the priming cup.

In addition to eliminating your starting troubles in winter and increasing the power and speed of your car while running, the IECO MANIFOLD PLUG will actually save you within three months the price of the plug in a reduced gasoline bill. The intelligent automobilist will immediately take advantage of this proposition.

The Manifold Plug has an ELECTRICALLY HEATED coil on the inside of the plug that actually boils and vaporizes the gasoline and does not depend upon superficial spraying, which is poor, to say the least, in cold weather. Besides, the vapor enters the manifold near the cylinders and cannot condense before being drawn into the engine.

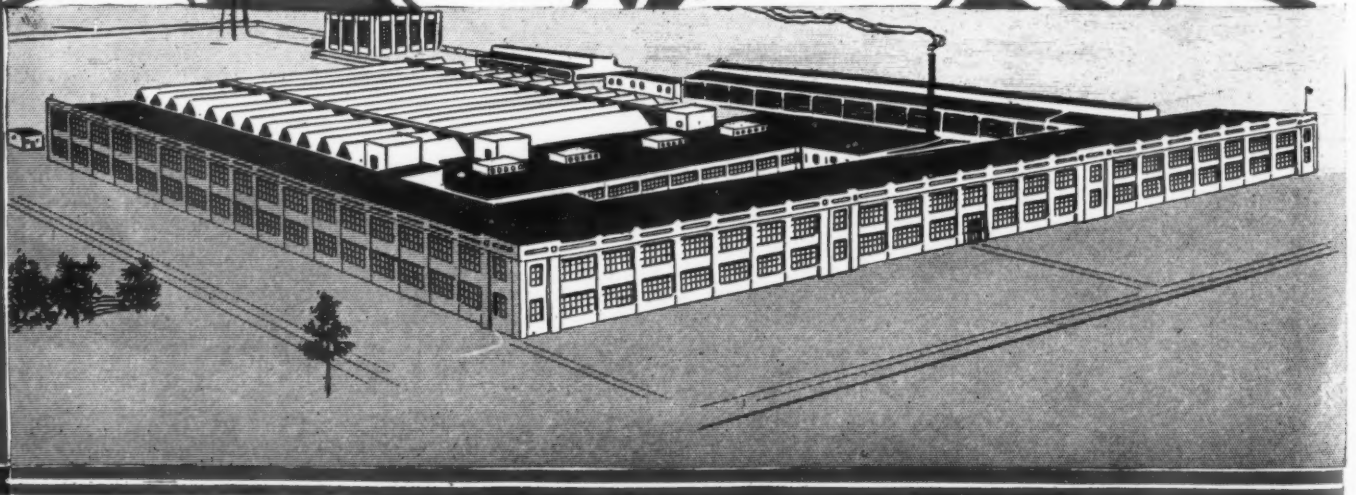
Price for any car \$5.00 complete and ready to install. Current is taken from either dry cells or storage battery.

Sent postpaid on receipt of price or C. O. D. Parcel Post on receipt of order.



INTERSTATE ELECTRIC CO.
358 BARONNE STREET, NEW ORLEANS

This is the Day of the Continental



Please mention The Automobile when writing to Advertisers

123 manufacturers have seen the light; 123 leading makes of motor cars—pleasure and commercial—now take their motion from the Continental Motor; 123—where a year ago there were 60!

Such a growth is profoundly significant. It marks a positive conviction that Continental Certainty is now fundamental in the structure of motor cars whose makers are striving hardest to reach the goal of perfection.

Continental Motors

It marks the final establishment of a definite quality basis in manufacturing—assuring a permanent market for the maker, and a permanent guarantee of goodness for the owner.

The trend toward this standardization has been slow but steady. For twelve years Continental Motors have been leading the way.

Scores of makers knew the overwhelming advantages of a Standard Motor, from both the production and the sales standpoint. They only awaited the right motor, a motor of known quality and national reputation.

Now they have it in the Continental—have a motor proved by time, endorsed by more than a hundred thousand drivers, known favorably to every dealer in the land.

This is the reason for the landslide Continental-ward.

For the manufacturer who today builds into his product a Continental Motor, builds in also an added prestige that carries tremendous advantage for maker, dealer and owner.

This is the day of the Continental—

broad sunlight of well-earned reputation, shining into every nook and corner of motordom.

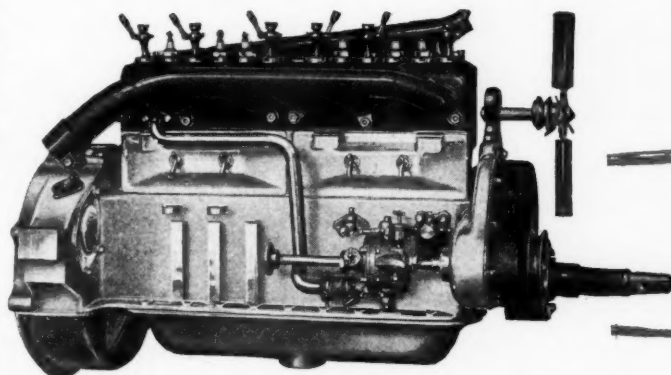
Get into the flood of light. Get your place in the sun.

CONTINENTAL MOTOR MFG. CO.

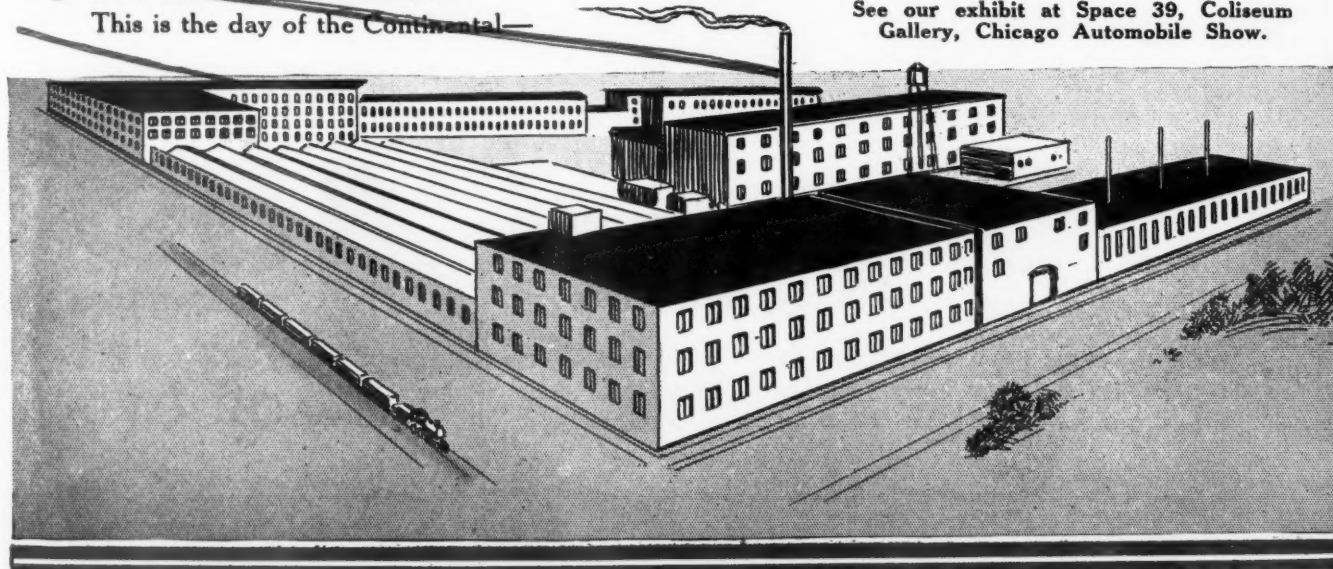
DETROIT, MICH.

Largest exclusive motor builders in the world

Factories: Detroit and Muskegon



See our exhibit at Space 39, Coliseum Gallery, Chicago Automobile Show.





Our 40 Years' Manufacturing Experience and Reputation Stand Back of This New Product



$\frac{3}{4}$ Actual Size

The C-C Shock Absorber is not a makeshift nor the result of an impulse. It is a development and a refinement of manufacturing conditions.

It is just as real, just as efficient and just as high quality as any shock absorber ever produced at any price, notwithstanding the fact that it is made to sell for \$8.00 for a set of four.

Just as the Ford Company has been able to continuously and materially reduce the cost of its car by increasing its production and by the installation of manufacturing refinements, just so have we been able to reduce the cost of shock absorbers until we have today a real Ford Shock Absorber made to sell at a price commensurate with the original cost of the car.

Unless your Ford is operated at the minimum of cost and the maximum of comfort and efficiency you are not getting all that the Ford can be made to give you. You have frequently realized that the use of an efficient shock absorber would greatly increase your Ford satisfaction but the price heretofore has been too great.

Now as a result of this 40 years of manufacturing experience, five years of which have been devoted to the problem of shock absorption, we have been able to produce the C-C and at a price you will not hesitate to pay.

Go to your dealer today, have him show you the C-C, its simplicity and sturdiness and have him explain its principle.

When you do this you will take a set of four and have them attached while you wait. It only takes half an hour.

8.00
for set
of four

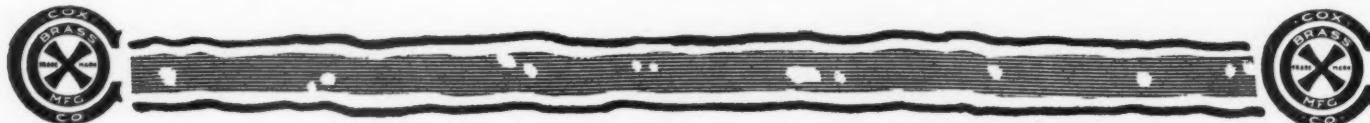
Cox Brass Mfg. Co.
Albany, New York

BRANCHES:

1777 Broadway
New York City

2637 Michigan Ave.
Chicago, Ill.

4.50
for set
of two



Please mention The Automobile when writing to Advertisers



"The New C-C for Any Car"

regardless of the kind you own, offers you through its use a degree of comfort and economy hitherto possible only by an investment of at least five times the price of the C-C.

The new universal C-C is the masterpiece of shock absorption construction. It is our supreme effort after 40 years of manufacturing experience and we are proud to put the Cox trade mark (the guarantee of absolute satisfaction) upon it.

The new C-C is a sturdy, husky shock absorber designed to take care of the jolts and jars suffered by the heaviest of cars. We would not hesitate to recommend it for use on a limousine weighing two and a half tons, so certain are we that it will stand up to its work, even in that event.

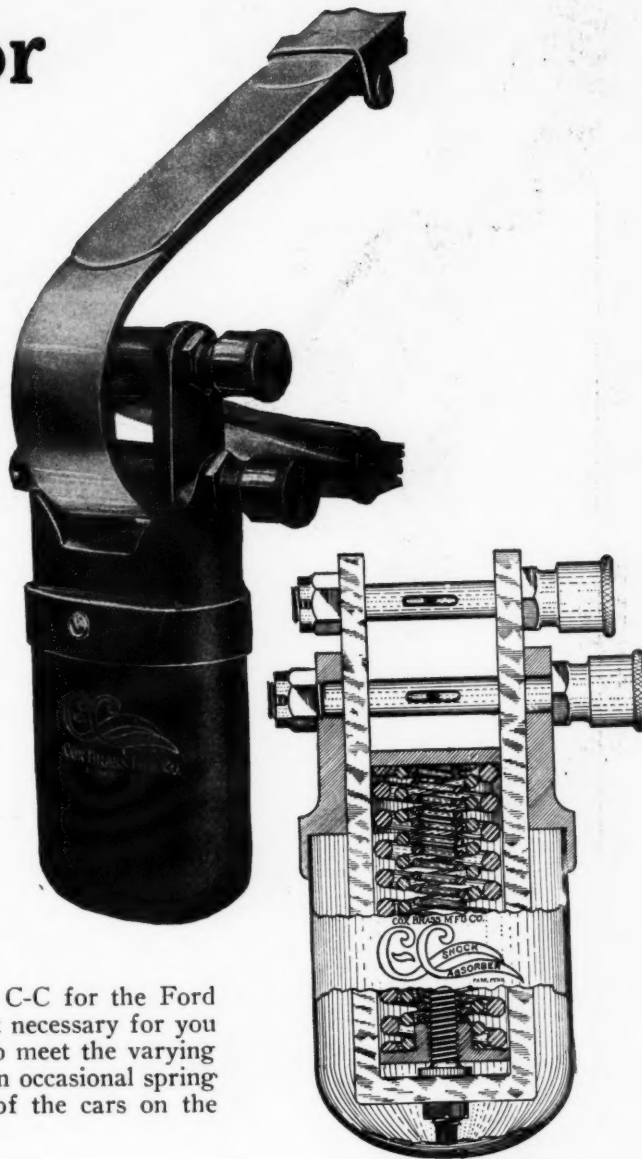
Note the triple spring construction as shown in the line cut herewith. That's only one of the many reasons for the superiority of the C-C.

No longer need you sacrifice your car and your comfort for the new C-C at \$10.00 will serve you and your car satisfactorily as long as your car will last.

Go to your dealer to-day and have him attach a set of C-C's and you'll swear you have a new car.

DEALERS: Think what the Cox line means to you, the C-C for the Ford for \$8.00 and the C-C for any car for \$10.00. No longer is it necessary for you to carry in stock a dozen different sizes of shock absorbers to meet the varying calls from the different type car owners. The new C-C with an occasional spring change (that you can make yourself) will fit 95 per cent. of the cars on the road to-day.

Write us to-day for our dealers' terms. They're mighty attractive.



$\frac{1}{3}$ Actual Size

**easily
applicable
to any car**

Cox Brass Mfg. Co.
Albany, New York

BRANCHES:

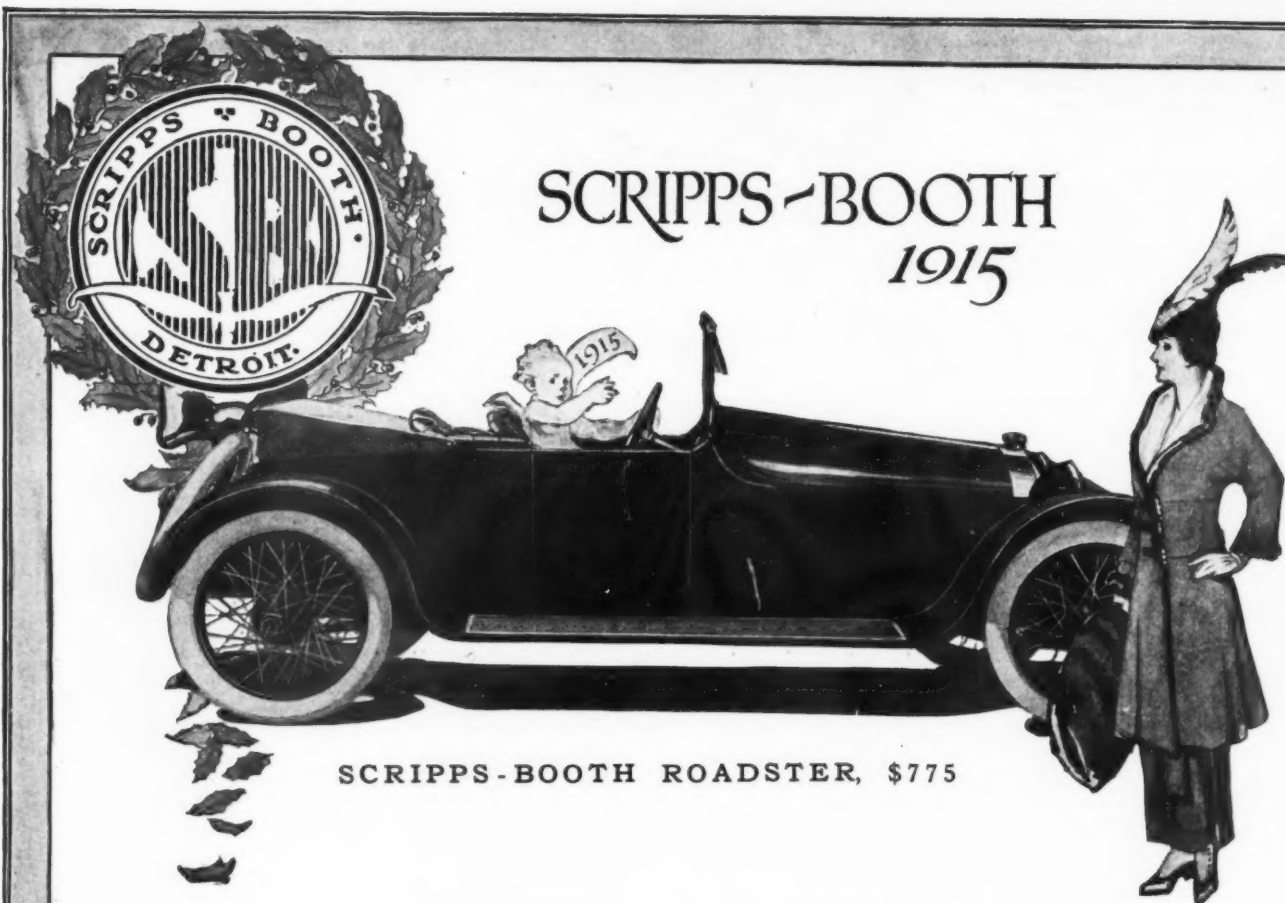
1777 Broadway
New York City

2637 Michigan Ave.
Chicago, Ill.

10⁰⁰
**per set
complete**



Please mention The Automobile when writing to Advertisers



SCRIPPS-BOOTH ROADSTER, \$775

SPECIFICATIONS:

110-inch wheelbase, three passenger car.

MECHANISM

Four-cylinder motor, three-speed gear-set, shaft drive, bevel gear rear axle.

EQUIPMENT.

Absolutely complete from electric self-starting and lighting system to electric door locks.

FINISH

Finest possible, both as regards upholstery, instruments, dash equipment and body finish.

DETAILS

Body—Streamline, torpedo stern, highest grade blue-black finish, domed fenders. Upholstery, finest quality long-grain buffed leather. Cowl dash instruments; sight feed oiler, lighting and dimming switches, starting strangle, starting and ignition switch, flush type speedometer, generator indicator, shroud light and foot space light.

WHEELS

Five Houk, triple-laced detachable wire, 30x3½ inches, wide hubs.

AXLE

Rear, full-floating, annular bearings throughout. Bevel drive. Ball bearing, universal joints on the Kardan shaft. All gears and shafts 3¼% nickel steel. Drive shaft tubular.

New Year

The Spirit of the New Year is for better things.

The world builds on the progress of the past; each new idea, a step; each year, an epoch.

With each succeeding twelve-month of motor car progress comes greater demand for new comfort, further luxury, and more complete appointment.

SCRIPPS-BOOTH luxurious light cars offer in mechanism, the newest engineering ideas of comfort-efficiency; in appointments and interior, the newest standard of luxurious equipment; in road performance, the highest possible standard of riding comfort; and in detail, show a consistent betterment of past motor car efforts, which expresses in itself the very spirit of the New Year.

SPECIFICATIONS:**MOTOR**

Sterling, valve-in-head type, high speed, gears in unit, pump feed oiling with sight feed on dash, 2½ bore, 4-inch stroke, four-cylinder, water cooled. Develops 18 horsepower. Fitted with Zenith carburetor and Atwater-Kent automatic spark advance, connected with starter generator system.

STARTING

Bijur single unit electric, connected by silent chain, operated by locking dash switch.

SPRINGS

Front, semi-elliptic with over-slung frame. Rear, floating cantilever.

EQUIPMENT

Silk mohair top with side curtains, rain vision plate glass windshield, electric door lock, Klazet horn, full tool equipment, jack. Luggage space at the rear large enough for two suit-cases and tools. Spare Houk wheel, tire and tube on all cars.

FEATURES

Klazet button in center of steering wheel cannot be operated when ignition switch is off, eliminating miscellaneous horn blowing while the car is standing. No projecting handles or slots in the doors. Electric door locks are operated by pressing a small push button.

SCRIPPS - BOOTH CO.**DETROIT, MICHIGAN**

19



15

Dealers!!!

A GREATER DISCOUNT IN 1915

The placing of your initial order for Automobile Blue Books
BEFORE FEBRUARY 1, 1915

determines your discount for the entire year

A PROFIT TO YOU OF 95c ON EVERY BOOK SOLD

The following discounts take effect at once on 1915 Blue Books
LIST PRICE, \$2.50 PER COPY

33 1-3% AND AN EXTRA 7% DISCOUNT

if your initial order is placed before February 1st and is for a quantity of books equal to 75% of the books you sold in 1914. Delivery date as per your instructions. All books of initial order to be delivered before July 1st.

25% AND AN EXTRA 7% DISCOUNT

on single orders, or those less than six copies, if placed before Feb. 1st. The double discount offered above to all dealers placing their orders before February 1st will be allowed them on all following orders of any quantity during 1915.

Dealers not taking advantage of the above offer will be allowed only the first discount throughout the year and thereby lose the extra 7%

New Jobbers' discounts are made to strictly recognized jobbers

AUTOMOBILE BLUE BOOK PUBLISHING COMPANY

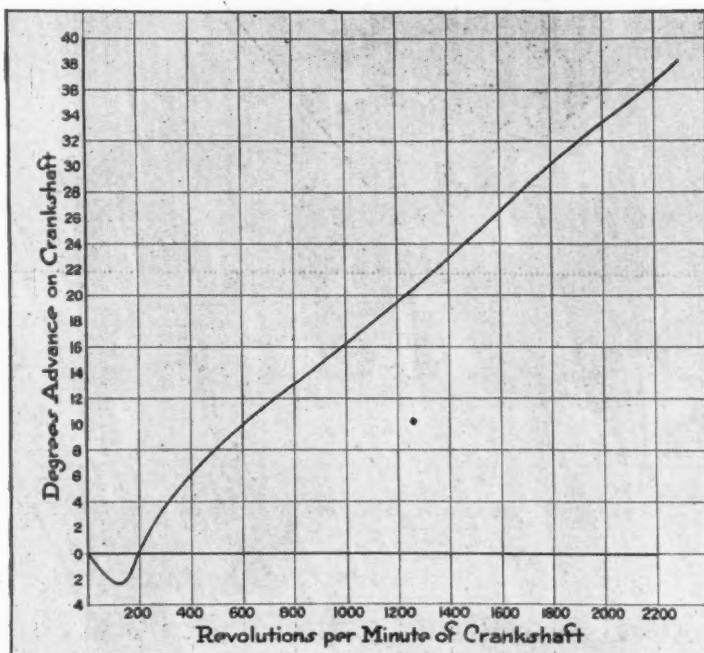
912 S. Michigan Ave.
Chicago, Ill.

245 West 39th Street
New York City, N.Y.

ATWATER KENT

"The governor automatically advances and retards the spark with the speed of the engine much better than the same operation can be performed manually by an inexperienced driver."

Regal Motor Car Company, M. S. Young, Eng.



"The Atwater Kent System is practically the only one with a successful automatic spark advance which relieves the driver of all concern regarding the setting of the spark, and does its work as efficiently at one speed as others."
R. E. Cole, chief engineer, Saxon Motor Co.

Spark Advance Curve of the ATWATER KENT IGNITION SYSTEM

The value of an automatic spark control depends on the regularity of the advance.

An irregular "curve" may be worse than manual control, erratic though the latter usually is.

A uniform curve will give a smooth action and rapid acceleration very difficult to duplicate by hand.

As some curiosity has been expressed regarding the true nature of the Atwater Kent curve, we here publish a typical photograph from a recent test of a stock instrument.

Atwater Kent Mfg. Works

4938 Stenton Ave., Philadelphia, Pa.

Stewart PRODUCTS

The STEWART Vacuum Gasoline System does away with all need of air pressure—eliminates hand and power pumps—air gauges and all air-tight connections.

It supplies an even flow of gasoline to the carburetor at all times regardless of what the grade may be.

This system enables car manufacturers to adopt the fashionable low-set streamline body. It enables them to do away with the somewhat dangerous, odorous and inconvenient gasoline tank in the cowl, as well as the gasoline tank awkwardly placed under the front seat.

NOW

\$10

The STEWART Vacuum Gasoline System absolutely overcomes all the disadvantages of pressure and gravity feed systems.

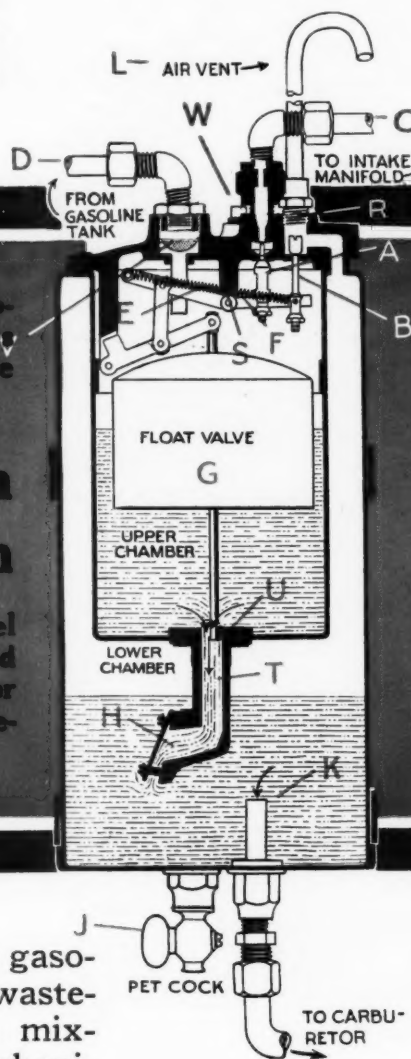
Stewart Vacuum Gasoline System

It soon pays for itself in the fuel it saves. In recent tests sanctioned by the A. A. A. it showed better than 15 per cent. increase in mileage per gallon.

Can be installed in an hour's time on any car, old or new, at any garage or at any of our Branches or Service Stations.

Try it on Your Car for 30 Days

Comes complete with all connections. Write for full particulars.



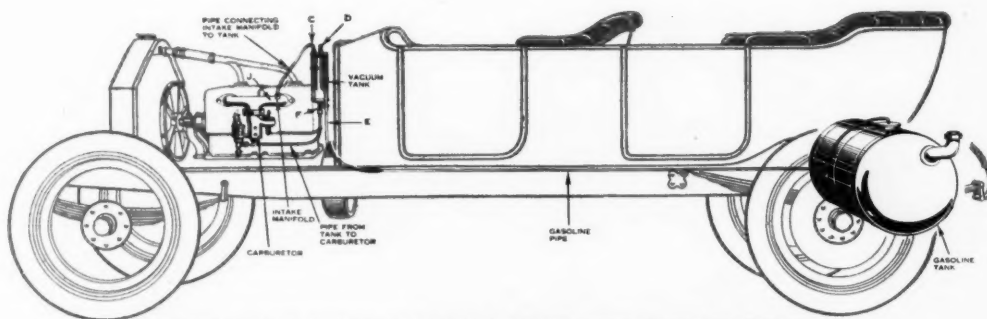
There is no forcing of the gasoline through the carburetor wastefully—causing an over-rich mixture, a sluggish motor, or carbonization.

It works absolutely AUTOMATICALLY, requiring no attention whatever once it is installed.

Permits the gasoline tank to be put in its logical position in rear of car—placing the weight where it can be carried

to best advantage, without detracting from the car's easy riding qualities.

DEALERS: Write for interesting Sales Proposition.



Illustrating installation of STEWART Vacuum Gasoline System, under hood on dash, or it may be mounted directly on motor.

17 Branches

Stewart-Warner Speedometer Corporation

70 Service Stations

"Always on the Job"

Stewart PRODUCTS

Look for the name "Stewart" on all Stewart Products. It is a guarantee of Prestige, Quality, Service and Satisfaction.

This unprecedented price of \$5.00 is only made possible by our policy of producing STEWART Products in enormous quantities.

No Need
to
Pay More

This double bracket on a STEWART Warning Signal holds it absolutely rigid and secure. It never rattles. It can't work loose.



The name "STEWART" has special significance when borne by a Warning Signal priced at \$5.00—the lowest price a thoroughly high-grade hand-operated signal has ever reached. It adds authority to the statement that the STEWART Warning Signal in design, appearance, in material and performance, is the finest hand-operated signal built—regardless of price.



A swivel bracket enables the STEWART Warning Signal to be adjusted to direct warning blast straight ahead, and fits top rail of car perfectly.

The price is so small, the measure of quality so large for the reason that we require no separate plant to make and no separate organization to market this Warning Signal.

The STEWART Warning Signal is full-grown in every respect.

The length of the trumpet part of the horn is much greater than other makes of horn sold near its price, which means just so much more sound-carrying power.

"Always on the Job"

Stewart PRODUCTS

The STEWART is the easiest operated Warning Signal sold. No effort is required, no feeling for a button or holding it down. The slightest touch of hand or elbow sounds the warning—sharp, penetrating and clear enough to cut its way through the rattle and roar of the loudest traffic and carry a mile ahead on country roads.

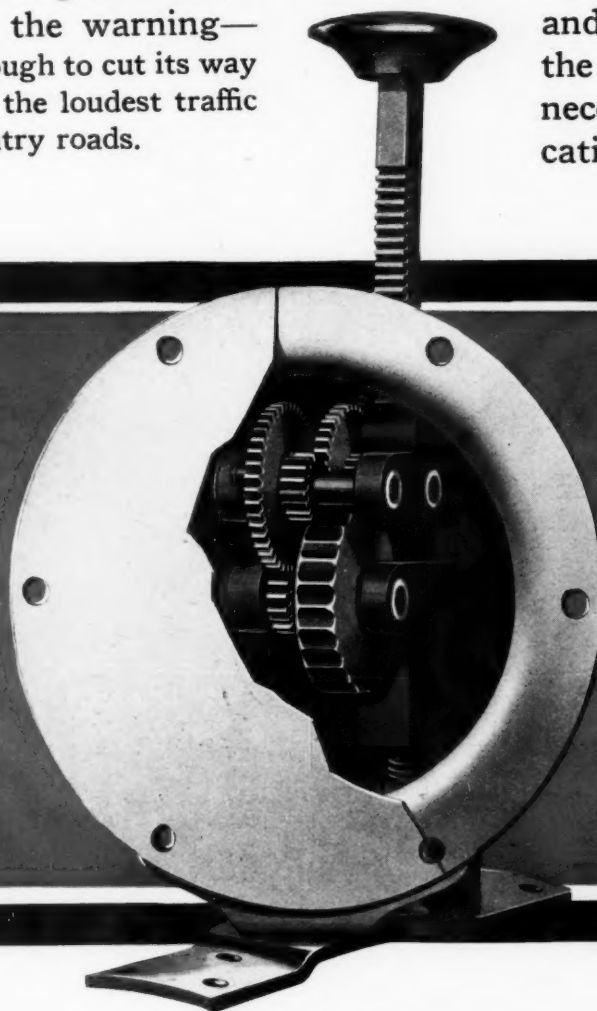
A felt pad oiler insures proper, **CONTINUOUS** lubrication to every bearing and wheel. It **RETAINS** the oil and eliminates the necessity of frequent lubrication.

Note the extra large Swedish steel diaphragm. One push of the plunger results in 192 distinct sound impulses against this diaphragm.

The sound produced is big-voiced and unsurpassed in penetrating and far-carrying qualities.

Stewart Warning Signal

Note the wide-faced, case-hardened gears. They are **CUT**, not stamped, from the highest-grade steel. They are carried in a frame with each gear mounted on double bearings.



No one-sided bearings are used, because of their being continually subjected to rack and wear.

Each bearing is mounted in a hardened steel bushing, insuring positive alignment, and exceedingly long life of service through the elimination of wear.

Built To Last

No part of this signal is soldered.

All parts are riveted or bolted to stay permanently—regardless of hardest usage.

30-Days' Free Trial

Put a STEWART Warning Signal on your car with the understanding if not satisfactory after 30 days' trial, full purchase price will be refunded. Furnished in handsome black enamel and nickel or black and brass finish.

DEALERS: Our 30-Day Free Trial makes a sale out of every inquiry.

It costs Nothing to operate

The STEWART Warning Signal is a self-contained unit dependent upon neither batteries, wires, nor connections of any kind. It has no short-circuits, loosened connections or weakened batteries to contend with. It is on the job all the time whether your batteries are or not. It does not drain current from the lighting and starting system. You pay for a STEWART Warning Signal but once. Its first cost is final. Its upkeep is nothing.

Stewart PRODUCTS

The STEWART Magnetic Speedometer costs more, but it is worth more.

Stewart

But everything considered—workmanship, accuracy and service that reaches all over the world, it really costs less in the long run than the other kind.



90% of all the Speedometers in use are Magnetic Type.

Speedometers

Despite the higher cost, most car manufacturers equip their cars with the famous STEWART Magnetic Speedometer. They realize that the value of the car's accessories reflects the quality of the car.

Illustrated in the lower half of this page is the STEWART Tire Pump—a product which for \$15 will emancipate any car owner for life from hand pumping, the dirtiest, hardest work about a car.

Stewart Tire Pump

Pays for itself the first long trip you take in the heavy work and tires it saves you. Does away with guessing how much pressure you have put in your tires.

Prevents under-inflation due to lack of strength or time to give your tires the proper pressure by use of a back-breaking hand pump. Enables you to get maximum mileage from your tires.

Let the

Stewart Tire Pump do your Hard Work

This pump settles the argument of proper pressure when it comes to making an adjustment for short mileage with the tire company. It puts smiles in the place of "hand-pump grouch" which has spoiled more than one day's motoring.

\$15

Price, complete with 15 feet highest-grade rubber hose, bracket and gear, accurate air-gauge ready for immediate installation.

30 Days' Free Trial

Can be installed in an hour's time on any car, at any garage or any of our Branches or Service Stations.



With the STEWART Tire Pump you simply throw over a little lever. Your motor and the STEWART Tire Pump do the rest. No more danger of your becoming sun-struck through over-exertion in summer—no danger of getting overheated or catching cold in winter. No blistered hands, sore muscles or "cuss the car" feelings.

DEALERS: Write for interesting sales proposition

Stewart-Warner Speedometer Corporation

Factories: Chicago and Beloit, U. S. A.

17 Branches.

Executive Offices: 1931 Diversey Boulevard, Chicago

Service Stations in all cities and large towns

"Always on the Job"



Ignition Advice For You

A good ignition system is a necessary part of every engine. Batteries alone, or as a part of another system, cannot be expected to retain that essential feature of absolute reliability which an ignition system should have.

If your engine is fitted with a good magneto, you obtain your ignition current from a mechanical source, a source that practically has perpetual life, a source that cannot be made inactive by ordinary damage, nor even by forgetfulness. It is not affected by heat or cold, by rain or snow, by continuous or intermittent use.

Ignition is a factor too important to slight. It should be given more than passing consideration or comment. It should be investigated as closely and as carefully as the engine itself, for upon the ignition system the ability of the engine depends. In fact, the whole car, your comfort, your pleasure, everything depends upon the ignition system.

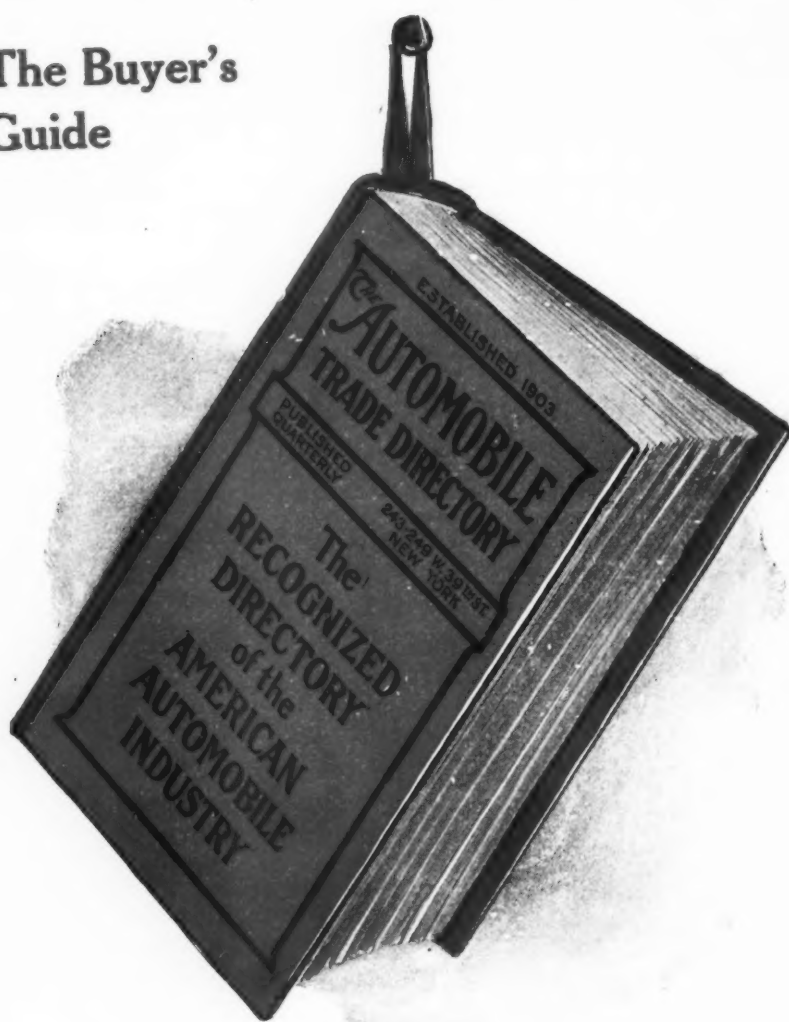
Don't select "any ignition"; don't be misled by such broad terms as "high tension", "jump spark", or "magneto"—insist that you be given a dependable, no-worry system—a Bosch Magneto.

BE SATISFIED | *No one ignition system is used as universally as the Bosch Magneto* | **SPECIFY BOSCH**

BOSCH MAGNETO CO., 220 West 46th Street, New York
Chicago—Detroit—Over 250 Service Stations—San Francisco—Toronto

The Buying Mediums of the

The Buyer's Guide



THE Automobile Trade Directory is part of the business equipment of every dealer, garage, repair shop and supply house—it is a most important buying guide to the factory purchasing agents and engineers.

You, as a manufacturer, must rely on these people for the distribution of your product.

"The Red Book" reaches and stays with absolutely every one of them—not for a week or a month, but year in and year out.

It is used by these buyers when they are in the most responsive mood—when they are ready to buy and need only information.

THE Directory is one a buyer's seller's index—common to all in any

tem. With the use of these mediums you can reach a definite field you wish to reach, and talk to

THE AUTOMOBILE TRADE DIRECTORY

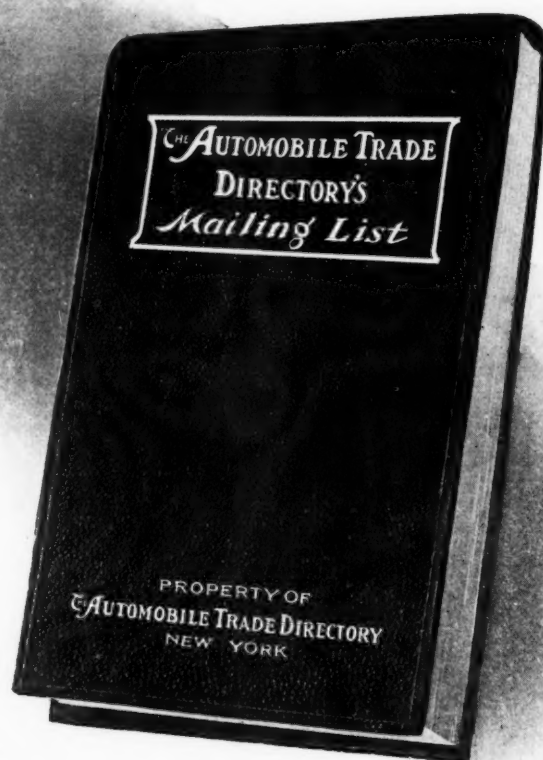
Please mention The Automobile when writing to Advertisers

and Selling *Automobile Industry*

THE Standard list of those who sell to the automobile trade. It embraces the entire purchasing power of every phase of the automobile and motor truck industry, comprising the dealers, garages, repair shops, supply houses and Purchasing Agents, Engineers and other officials of automobile, commercial vehicle and motor manufacturers.

Every name given is a live and legitimate concern or business man, conducting a business as listed. To keep pace with changes both of personnel and activities of various concerns complete supplements and revision sheets are furnished the first of each month.

The Seller's
Index

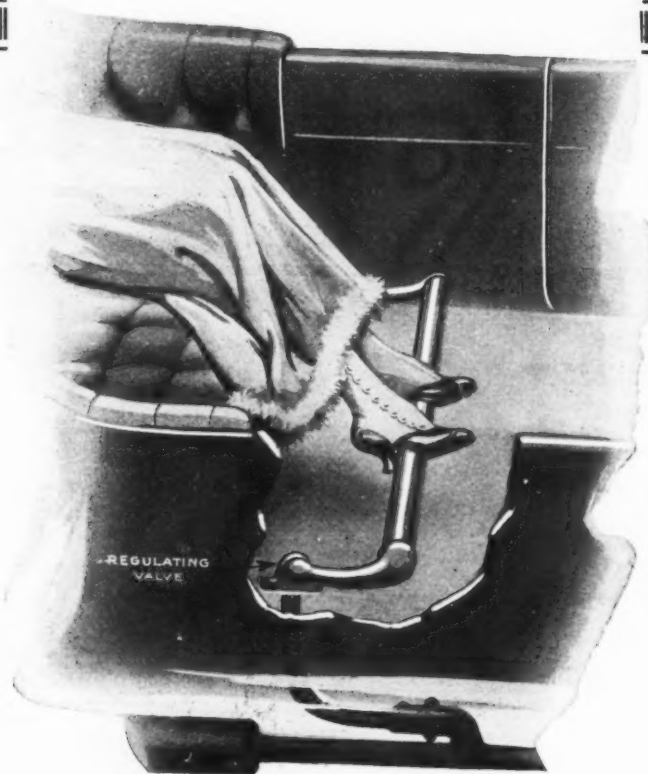


y and Mailing List—
s guide, the other a
n plete a business sys-
u can concentrate your selling effort to the
o more active buyers for less money than
y other way.

Y **243-249 WEST 39TH STREET, NEW YORK**

Please mention The Automobile when writing to Advertisers

The Best Selling Winter Accessory on the Market



See these
car comforts
at the
Auto Shows

K.P. Foot Rest Heater

It does seem foolish that a gasoline engine should be generating so much heat and let it all go to waste, while the passengers in the tonneau shiver with the cold.

Everybody appreciates the foolishness of that situation and realizes at a glance how simple and practical the K.P. FOOT REST HEATER is in the way it makes use of an otherwise waste commodity.

The K.P. is noiseless, odorless and expenseless. It is a handsome ornament in a car, for it looks infinitely better than the ordinary foot rest. Its regulating valve makes it easy to control by the passenger. It is easily attached. Furnished in lengths to fit any car, and made up in oxidized, nickel-plated or brass finish.

The price is \$25 (f.o.b. New York), including all parts for attachment.

The dealer who has put it on display has found that it is as near a self-selling device as he could handle.

Now is the time to sell them.

Now is the time buyers want them.

Now is the time you should handle them.

Get complete literature and dealers' proposition.

K.P.

The K.P. Foot Rest Heater Company

250 W. 54th Street

New York City

and at every "J.M." Shock Absorber
Distributor — listed herewith.

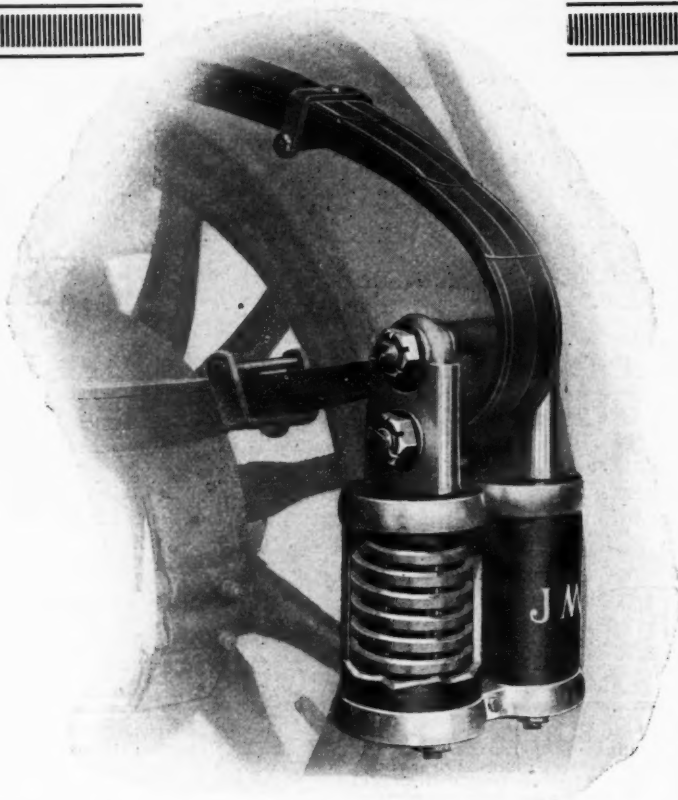
Please mention The Automobile when writing to Advertisers

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Buffalo, N. Y., 846 Main St.
Pittsburgh, Pa., 5919 Baum St.
Atlantic City, N. J., 12 S. Virginia Ave.
Baltimore, Md., 10 W. Eager St.
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Hartford, Conn., 230 Main St.
Cleveland, O., 5906 Euclid Ave.
Cincinnati, O., 801 Main St.
Boston, Mass., 222 Eliot St.
Providence, R. I., 11 Dor-rance St.
Newark, N. J., 237 Halsey St.
Brooklyn, N. Y., 143 Rogers Ave.
Albany, N. Y., 288 Central Ave.
Springfield, Mass., 216 Main St.
New Haven, Conn., 31 Temple St.
Bridgeport, Conn., 277 Fairfield Ave. and 148 Cannon St.

No Dealer's Establishment is Realizing Maximum Profits without the

New York Show
Booth D 42
Chicago Show
Booth 99



J. M. Shock Absorber

They are the only really perfect shock absorbers built. They were the first of their kind, and have always maintained the highest conceivable standard of materials and construction.

The J. M. SHOCK ABSORBER business is the kind of business any highly reliable dealer is proud to have. "J M" stands for the best in shock absorbers and when a man buys this kind at a legitimate price which gives a reasonable profit to the dealer, the J. M. Shock Absorber Company stands behind them with its nation-wide service and its responsible guarantee.

The J. M. is now produced for cars of every size and type. Altho the J. M. famous Twin type, shown at the top, has proved itself supreme for large cars, yet we have produced other models which exactly meet the needs of lighter weight cars.

The Ford J M Type 3 (shown below) has established its reputation as the greatest of all Ford Shock Absorbers. It is not the cheapest but it is the least expensive in the long run. It assures real comfort to all Ford owners and it lives as long as the car. Has a unique sliding tube container and is self-oiling. Illustrated pamphlet "P" tells all about it.

NOW NEARLY READY. A NEW TYPE J M FOR OVERLAND AND SIMILAR CARS

This absorber meets the demand for cars of not over 3500 pounds. It is based on J M principles, has J M construction and efficiency throughout. For Overland, Buick, Hupmobile or any car (except the Ford lighter than 3500 pounds) this is the shock absorber.

Write to-day for full details on this J M Type Z-2.

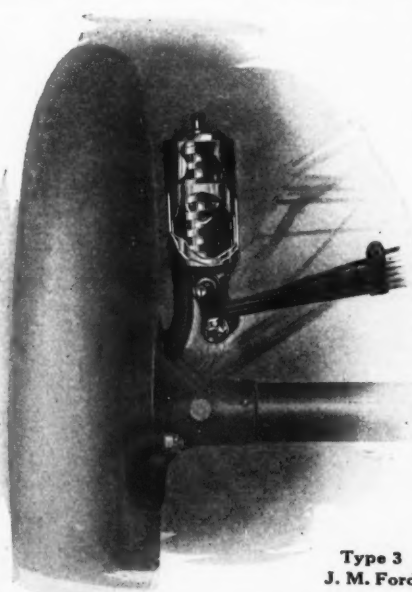
The Big News in Shock Absorbers

The "J.M." Shock Absorber Co., Inc.

Main Office and American Factory:
210 So. 17th Street, Philadelphia

New York Factory Branch:
250 West 54th Street

JM



Type 3
J. M. Ford

BRANCHES

Pittsfield, Mass., South Street Garage.
Waterbury, Conn., 13 E. Main St.
Altoona, Pa., 1009 Chestnut Ave.
Trenton, N. J., 127 Academy St.
Minneapolis, Minn., Hennepin and Harmon Place.
St. Louis, Mo.
San Francisco, Cal.
Los Angeles, Cal.
Erie, Pa.
Atlanta, Ga.
Houston, Tex.
Dallas, Tex.
Kansas City, Mo.
Pottstown, Pa.
New Orleans, La.

CANADIAN DISTRIBUTORS:

Canadian Fairbanks - Morse Co., Ltd., Montreal, Quebec, Ottawa, Toronto, Ont.
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Saskatoon, Sask.
Calgary, Alta.
Edmonton, Vancouver and Victoria, B. C.
St. John's, N. B.
ALSO IN EVERY CIVILIZED COUNTRY.

Please mention The Automobile when writing to Advertisers



Best Shock Absorbers for Front and Rear—"OIL CUSHIONIZED" SPRINGS

Springs are the *natural* shock absorbers with which every car is equipped. They are the *only* shock absorbers carried by the great majority of cars. The efficiency of these springs as shock absorbers depends on proper lubrication. The best shock absorbers are springs which have been "Oil Cushionized" with

DANN INSERT "The Insert of 10,000 Oil Pockets"

"Oil Cushionized" Springs never rust, squeak nor dry. They perform their normal function of a shock and vibration dampener. It is impossible for them to clog with rust and become vibration conductors.

"Oil Cushionized Springs" are the most satisfactory insurance against hard riding.

"Oil Cushionized" Springs lengthen car life by smothering mechanism-killing road "pound."

AT THE SHOWS

See us at New York, Grand Central Palace, Space D 31A, or at Chicago, Coliseum Annex, Spaces 153-154. Our exhibit will be one of the most interesting and sensational features. Don't miss it.

DANN Insert is the only article on the market that keeps springs—year in and year out—as supple, resilient and sensitive as the car manufacturer intended them to be.

See to it that your car's natural shock absorbers are given the attention they deserve. DANN Insert comes ready-packed in sets for any make or model of car. Write for pamphlet on "What Users Say."

DANN Oil Cushion Springs—furnished complete with DANN Insert ready installed between their leaves—are a new addition to our line. Supplied for any make or model of car. Dealers write.

DANN OIL CUSHION SPRING INSERT COMPANY

2282 Indiana Avenue

Chicago, Illinois



Please mention The Automobile when writing to Advertisers

Starting

DISCO

ELECTRIC
SYSTEM

Lighting

ALL THE REQUIREMENTS ESSENTIAL
FOR A

PERFECT STARTER YOU FIND IN THE DISCO

DISCO MEANS

SIMPLICITY—Simple design and construction mean low cost. If you have the DISCO your car WILL COST YOU LESS. Light weight a special feature. It fits under the hood of any car.

POWER

RELIABILITY—Correct electrical and mechanical construction gives the DISCO power to turn over your motor in the coldest weather, 200 Revolutions Per Minute.

IT SPINS THE MOTOR



The DISCO company, pioneers in the starter field, have built thousands of starting and lighting outfits. The system is built under the supervision of experts, who, since the inception of the idea, have devoted their entire efforts towards electrical starting and lighting efficiency.

THE DISCO-FORD STARTER OUR SPECIALTY
DISCO ELECTRIC STARTER CO., Detroit, Mich.

Please mention The Automobile when writing to Advertisers

DISCO-FORD Distributors
National Electric Starter Company
Detroit, Mich.
TEAR OFF HERE
ATTENTION FORD OWNERS
DISCO ELECTRIC STARTER CO., Detroit, Michigan
Gentlemen, Please send free booklet and full particulars about your DISCO-FORD Starter at \$99.00, including complete equipment.
Name
Address
City State

See It At The Show

GRAY & DAVIS

STARTING - LIGHTING SYSTEM

For **Ford** Cars

A cordial invitation is extended to all dealers, agents, supply men, motorists, etc., to visit our exhibit at the New York Show, Space C-28.

Here you will see the Gray & Davis system for FORD cars in operation.

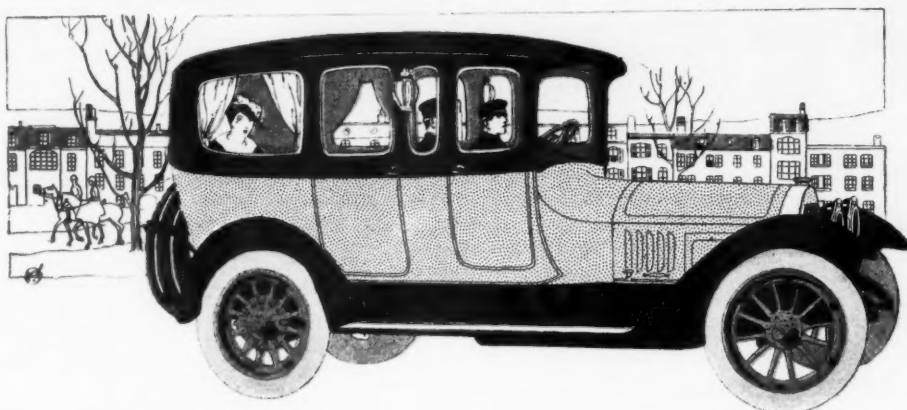
This is the fastest-selling accessory ever offered the motoring public.

In addition, we will show our complete line of starting-lighting systems, lamps, etc., at the Show.

Write for Descriptive Booklet

GRAY & DAVIS, Inc.

Boston, Mass.



The UNCOMMON CAR

Any motor car is a source of pleasure. A few motor cars are a source of pride.

A possession is doubly prized when it is *uncommon*, as well as excellent. The Uncommon Car is more than an excellent car. It is rare, as well as fine.

In America, motor cars, like almost everything else, are produced in large quantities. The Locomobile is an interesting exception. The Locomobile is an *uncommon* car because it is produced in small numbers.

The fixed policy is to concentrate on a few fine cars, not more than Four Cars a Day. Only one motorist in every three hundred owns a Locomobile. The fact that only one thousand Locomobile closed cars have been produced in ten years also illustrates the Locomobile idea of Quality instead of Quantity.

Limiting our production of fine motor cars enables us to specialize in *details*; enables us to express the requirements of those Families who are accustomed to the note of Individuality in all their selections.

Uncommon Interiors, in wide variety, are designed by Mr. John J. Petit, of New York, and finished in French Tapestries, English Broadcloths, French Velvets and Velours, selected and imported exclusively for Locomobile users.

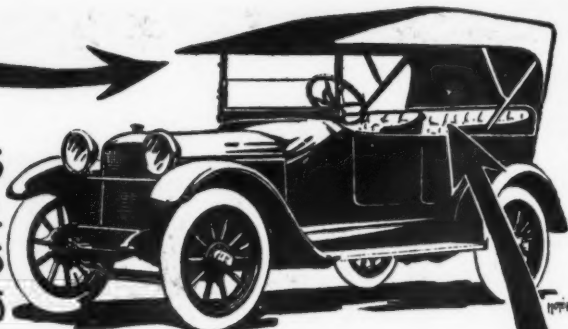
Lighting Fixtures by the Tiffany Studios. Adequate and becoming interior lighting effects.

Silk Curtains, Laces, Braids, and Carpets woven specially to match the individually decorated interiors.

Durable and finely finished Coach Work. Designs executed after the manner of the leading Foreign and American stylists.

The
LOCOMOBILE COMPANY
of America
MAKERS OF FINE MOTOR CARS

Use
CHASE AUTO FABRICS
 LEATHER
 MOTOR ROBES
 DREDNAUT MOTOR CLOTHS



**We Are
 Fabric Specialists**



**The Largest
 Manufacturers in
 This Line**

There isn't any class of material made that is subjected to more severe service than the fabric used in automobile tops. In order to give satisfaction it must retain its appearance of newness permanently, without fading, stretching, rotting or losing its waterproof qualities, in spite of continuous exposure to sun, wind, rain, snow and dampness. None but the best can stand these conditions.

Chase Auto Top Fabrics Are Most Reliable

We are the largest and oldest manufacturers in the country engaged in this line. Every yard is made in our mills and we have the largest output of any manufacturer. With fifty years of manufacturing experience, we have specialized on the making of top fabrics for more than thirty years. No other maker is so well equipped to produce quality and reliability. No other maker has the facilities to compete with us in price, on fabrics of equal quality.

For Permanent Satisfaction, Specify Chase Fabrics

CHASE LEATHER

The finest substitute for genuine leather now on the market. Best in appearance, durability and wearing qualities. Our "Galloway," "Gibraltar," "Buckskin" and "Imperial" brands are especially popular in the automobile trade.

CHASE MOHAIR, LUSTRE TOP AND SLIP COVER CLOTHS

Unexcelled in quality—complete in assortment.

Drednaut Motor Cloths

Under this brand we market the finest rubber fabrics known in the trade.

CHASE MOTOR ROBES

The Chase Line of Motor Robes is unexcelled in assortment, variety and novelty of patterns and qualities. We have manufactured and sold more automobile and carriage robes than any other one organization in America.

Chase Mohair Body Fabrics

Something new and distinctive. Will wear a life time. You should know about these when considering your upholstering proposition.

Auto and Top Manufacturers: Write our nearest office for quotations and samples on your requirements.

L. C. CHASE & COMPANY

Boston, New York, Chicago, San Francisco, Detroit, St. Louis

FALLS NEVER SLIP CASINGS



If you measure your tire quality in miles you will never use another make of casing after measuring the life of a "FALLS."

FALLS TIRES mean quality, safety, service and comfort.

They are the kind that "never slip." If you want the best made, try one.

EASTERN DISTRIBUTORS:

Royal Tire Company

833 7th Avenue
New York City, N. Y.

The Falls Tire Company

633 N. Broad St., Philadelphia, Pa.

The Falls Rubber Co., Cuyahoga Falls, O.



The **Jeffery** Chesterfield Six is not in competition with low-priced cars. It is not in competition with other medium-priced cars. **It is in competition with the highest-priced cars in the world.**

The Jeffery Six and

Disregard price and consider that the **Jeffery** Chesterfield Six is equipped with the Bijur Starting and Lighting System in use by the foremost cars of the world;

—that it is the only car in the United States in its price class having a four-speed transmission;

—that its worm drive is a type used exclusively on the finest electrics, and finest trucks and the best makes of foreign cars, but, with no important exceptions, on no other American car;

—that its finish—requiring 22 operations—is unsurpassed on any car here or abroad;

—that it has Tungsten steel valves five times costlier than the other kind, 3-plate dry disc clutch, imported annular bearings throughout, Bosch ignition throughout, New Model Stromberg carburetor, Stewart vacuum gasoline feed, Cantilever springs, Daimler leather coupling, Spicer universal joints, Waltham clock, and every refinement in the way of equipment.

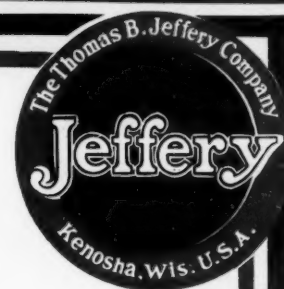
Consider that these are actually specifications of cars in the four or five thousand dollar price class yet obtainable in the medium-priced **Jeffery** Chesterfield Six selling at \$1650.

See the complete line of **Jeffery** Cars at the Shows, New York, Grand Central Palace, Space A31, or at Chicago, Coliseum, Space C3.



Chesterfield Six—\$1650

Something like a thousand dollars would have to be added to the price of the **Jeffery** Six-48, if this car were made in small quantities and saddled with heavy selling expenses.



Chesterfield Six-48

The **Jeffery** Six-48 is beyond question the biggest \$2400 worth of thoroughly high-grade motor car obtainable on the market today.

It meets the demand of the man who wants a larger car than the Chesterfield Six—a car built to the **Jeffery** Standard of Quality—generous in size, luxurious, comfortable, easy-riding and durable as cars in the four and five thousand dollar class, yet exceedingly economical in operation.

Although a full-grown seven passenger car, it weighs but 3700 pounds and delivers remarkable mileage per gallon of gasoline.

The power plant is a $3\frac{3}{4}$ by $5\frac{1}{4}$ high-speed—high-efficiency motor with cylinders cast in pairs.

Due to its 48-H. P. power plant, it is as "quick on its feet" as the smaller **Jeffery** models. An ideal car for both city driving and long touring purposes.

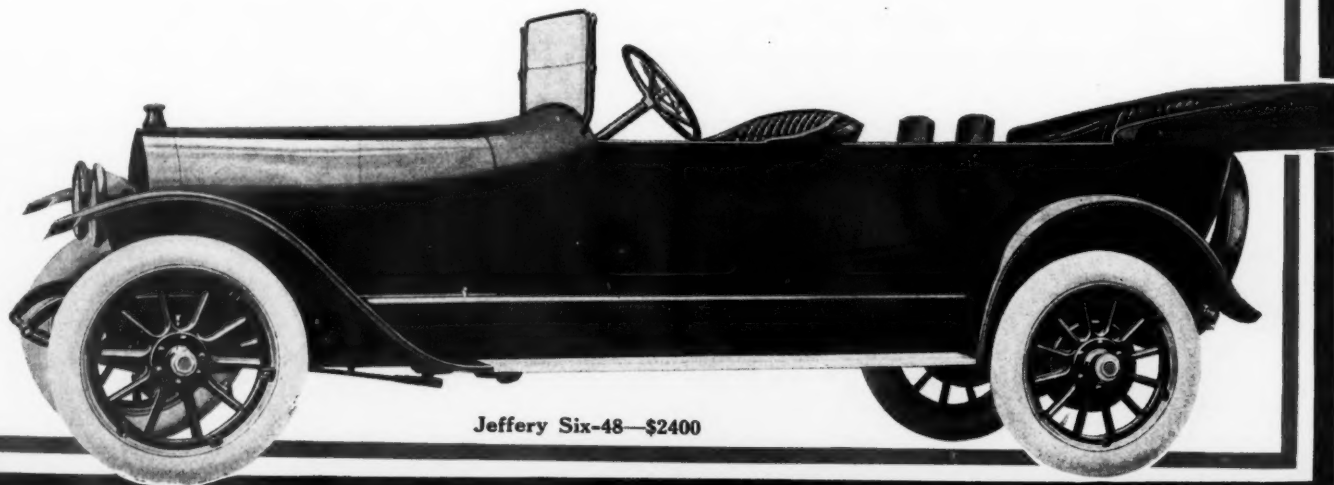
The wheel base of this car is $133\frac{1}{2}$ inches, and the tires are 36 by $4\frac{1}{2}$, on demountable rims.

Finest materials are used as in other **Jeffery** models and the equipment is complete in every detail.

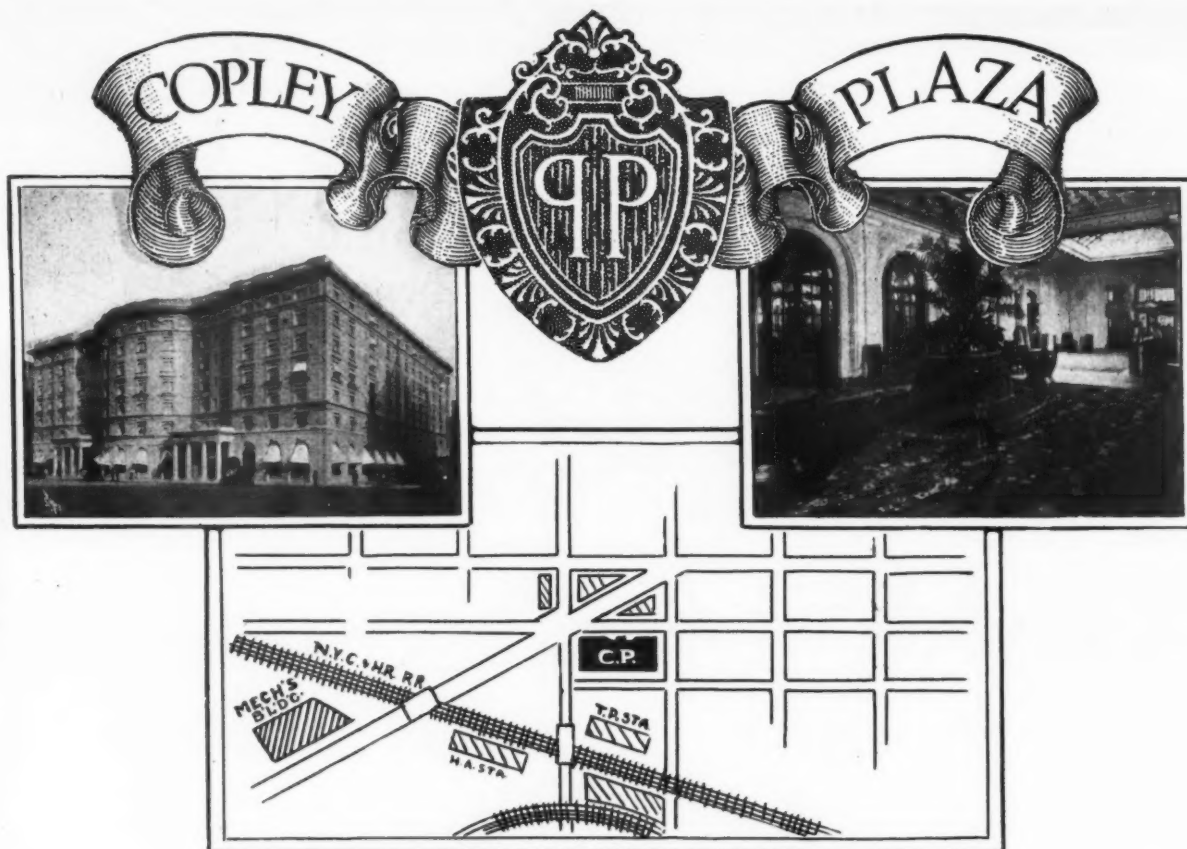
All prices f. o. b. Kenosha.

DEALERS: **Jeffery** Cars at their price offer the greatest opportunity in the field. See us at the Shows or write direct for detailed information.

The Thomas B. Jeffery Company
Main Office and Works, Kenosha, Wisconsin



Jeffery Six-48—\$2400



HOTEL COPLEY-PLAZA

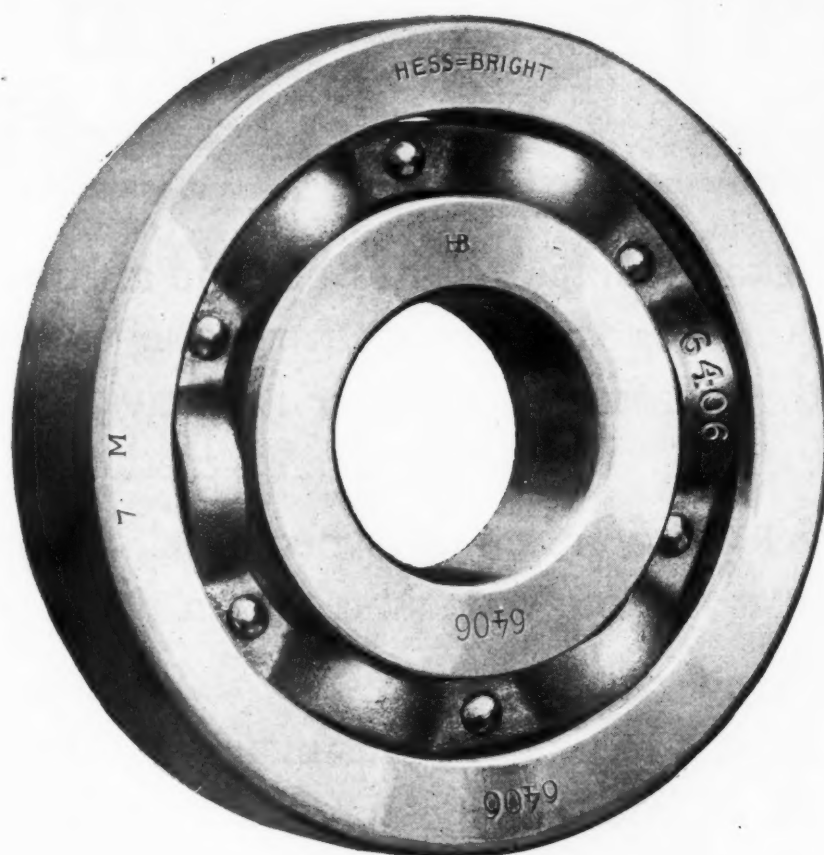
New England, as a field for the distribution and sale of automobiles is as potent in its possibilities as any other section of the country.

The Copley-Plaza is not only New England's finest hotel, but the advantages of its location, size, service and comforts make it the logical headquarters of those engaged in the automobile industry whose business or inclinations bring them to Boston.

Single Rooms with bath \$3.00 upwards. Suites and arrangements to meet any requirements. Excellent transportation and communication facilities. For details address E. F. Fogg, Mgr. : : :

COPLEY-PLAZA HOTEL . . . Boston, Mass.

HESS-BRIGHT



The QUALITY BEARING

THE HESS-BRIGHT MFG. CO.
PHILADELPHIA PENNSYLVANIA

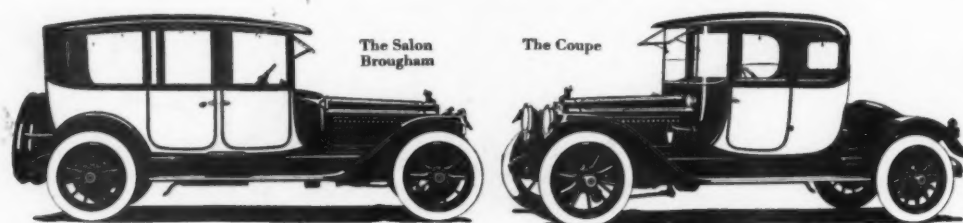
Please mention The Automobile when writing to Advertisers

"A PAIR OF SIXES"

Packard

3-38 AND 5-48

MADE IN AMERICA



Packard supremacy has become an institution. Car standards change from year to year... but the discriminating buyer is always sure of the Packard. It is his constant criterion.

Packard dominance is perennial, and this season it is more pronounced than usual.

The new Packard Sixes—"3-38" and "5-48"—reveal a sweeping readjustment of values as applied to road ability, comfort and elegance in motor cars.

Ask the man who owns one

PACKARD MOTOR CAR COMPANY

DETROIT · MICHIGAN

Only 11 Days Left

before

The Big New York Show Issue of THE AUTOMOBILE Closes Its Last Forms

December 22—only 5 days off.

All copy must be in hand, of which
proof is to be shown.

December 28—Last forms close.

This big issue appears December 31.

If you have not arranged to be represented in this important issue—

Act today.

The Automobile

239 West 39th Street,

New York City



\$1600

F. O. B. TOLEDO

Overland

Coupe

In What Other Coupe Do You Get—

Such attractive appearance?

Such convenience—electric switches, located on the steering column, so that starting, lighting, ignition and electric horn are within natural reach of the driver;

A high tension magneto which is the most dependable and uniform system of ignition;

Such large tires—35 inch x 4½ inch non-skid all around;

Comfortable capacity for four passengers;

All this and considerably more—at such a remarkably moderate price;

Deliveries can be made immediately.

*Catalogue on Request. Please
address Dept. 38*

**The Willys-Overland
Company, Toledo, Ohio**



